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IT is rumored that the Otis Iron and Steel Company, of Cleveland, is about to build a Bessemer plant.

A COPPER company in Arizona is looking for a man who thoroughly understands the concentration of copper ores: a person who has had experience on Lake Superior being preferred.

MR. E. N. RIOTTE, of this city, has started for the City of Mexico, on a professional trip. The metallurgical works of which MR. RIOTTE is manager will, during his absence, be in charge ofcompetent assistants.

THE first cargo of over five hundred tons of Cuban iron ore, shipped by the Jurugua Company, has arrived at the Bethlehem works. It is reported to average 63 per cent of iron, but it is said to contain considerable sulphur.

DR. E. D. PETERS, late superintendent of the Orford Copper and Sulphur Company, of this city, is now engaged in Butte City, Montana, as consulting metallurgist to the Parrott Silver and Copper Company, and metallurgist and constructing engineer of the Butte Copper Company's new works, where the Bessemerizing of copper matte according to MANHÈS'S method is now in course of introduction. The united capacity of these companies will probably reach two million pounds of copper a month.

THE movement started by Messrs. G. H. HULL & CO., of Louisville, to bring about a restriction in the output of pig-iron, is moving along slowly. Up to the 2d of September, 504 furnaces had been represented in the replies received, their aggregate capacity being rated as 6,614,345. The character of the replies may be noted from the following classification:

	Furnaces.	Yearly capacity.
Out and will remain out	239	2,728,750
Under contract for product	29	391,190
Use all they make	70	1,314,400
Total	338	4,434,340
Uncertain as to whether they will participate or not.	19	243,680
Will participate in restriction	81	1,094,550
Decline to participate in plan proposed	66	841,775

The promoters of the scheme, have, however, met with the difficulty that a large part of those favorable to their plan have their own ideas as to how it would suit them to go about it. A request has therefore gone forth to each furnace-owner, in the form of a new circular, asking him to state, in the elegant diction of that document, "what he is willing to do in the next six months looking to restriction, the understanding being that they will take this action irrespective of what other furnaces may do, the only condition being that should iron advance $3 a ton, or the stocks be reduced to 100,000 tons. then they will not be any longer bound to their agreement."

WHEN, two weeks since, we stated that 13 cents was the figure talked of as the basis of the fall Lake copper contract, the report was met by producers of copper with angry doubt. Only a week later, the sale had been consummated at that figure, and the great copper interests of the country are brought face to face with the fact that 13 cents is the best price obtainable for the best grade of the metal in the market. As usual, business will now drag along quietly for months. Other brands of copper have been pushed into consumers' hands with the utmost vigor for the past month, and the requirements of manufacturers and dealers for months to come are fully met. There is no hope of an advance for the rest of the year, and 13 cents for Lake and from 12 to 12½ cents for other known outside brands will be the prevailing figures, with prices below 12 cents for metal tainted with arsenic or tellurium. A rough estimate of the output of copper this year gives us the following:

Lake	68,000,000	to	70,000,000 lbs.
Montana	40,000,000	"	42,000,000 "
Arizona	22,000,000	"	24,000,000 "
California, Colorado, Utah, New Mexico, Missouri, etc.	3,000,000	"	4,000,000 "
Total	133,000,000	to	140,000,000 lbs.

Whether the minimum or the maximum is accepted, the fact remains, that the output of our mines has grown tremendously in the face of a constant decline in values. We have not included in the above estimate the quantity of copper obtained from foreign pyrites, so that the minimum estimate is conservative beyond all question. Taking it as the basis, it is probable that, out of the 25,000,000 pounds of copper from other sources than the Lake and Montana, fully 20,000,000 pounds have gone into home markets, the only company that sends out all of its copper being the United Verde, of Arizona, as its product carries notable quantities of silver. The Lake has thus far exported about 10,000,000 pounds. The disposition of the Montana copper is the most difficult to arrive at with any degree of accuracy. On a former occasion, we estimated the quantity coming into our market at 4,000,000 pounds, leaving the rest for export. We have since obtained information that points to a much larger quantity reserved for home consumption, and 8,000,000 pounds is probably not excessive. We have, therefore, as the amounts available for the United States 20,000,000 pounds of Arizona and other copper, 58,000,000 pounds of Lake copper, and 8,000,000 pounds of Montana copper, a total of 86,000,000 pounds of copper. Putting the consumption at the high estimate of 80,000,000 pounds of copper, we have an excess of 6,000,000 pounds, at least, which must either be carried by the Lake companies as stock, or be marketed abroad. There, the outlook is by no means encouraging. Much stress is laid on the favorable statistical position, and on the fact that deliveries have been exceedingly heavy. But it appears that these deliveries have been forced by constant concessions, and that notably the India market has been loaded with copper. A speculative movement may turn values upward, but it can not in the long run hold up a metal that is produced cheaper in all parts of the world, and in largely increased quantities. This increase has come suddenly, while the process of weeding out weak concerns is notoriously slow.

This fact is strikingly illustrated in our country, especially in the case of the smaller lake mines. Comparatively few have shut down entirely, while, on the other hand, a number of those who were near the

fatal line that divides the profitable from the unprofitable venture have increased plant to reduce expenses. We doubt if any of them have succeeded in the latter effort at as rapid a pace as the decline in the market value of the product has taken place. We would urge, therefore, in the most emphatic manner, that every lake mine that can not lay down copper in New York for less than 13 cents close down immediately. It is a useless exhaustion of reserves and of balances to continue at the present rate. Nor should any mine in the Rocky Mountains that can not lay down copper in New York at 12 cents go on with a hopeless fight, unless it can secure reductions in freights, on fuel and product to offset lower prices. Surface bonanzas of easily worked ores do not last for ever, and much better profits can be realized in the future. We believe it to be the duty of directors and managers to firmly take a wise stand in this matter, and we warn stockholders not to be cajoled by promises into propping up weak enterprises by voting assessments.

A question that is raised frequently during the present depression touches our copper and brass manufacturing industry. We hear it urged that efforts should be made to introduce copper for roofing, etc., and that our mills should begin to work for an export trade. Our copper producers have little to expect in that direction while the alliance of the manufacturers keeps the price of rolled copper from 5 to 6 cents above the price of ingot, when the cost is less than one half of that sum. Little can be expected until they are forced by the competition of rolling-mills established at some such point as Chicago to abandon the policy of small output with large profits, for that of making large quantities of manufactured articles at a reasonable advance over the cost of the raw material. Not until the home market is partially wrested from the reigning clique will the latter begin to look for customers abroad, and push the metal into new uses at home.

CORRESPONDENCE.

[Communications will be noticed only when accompanied with the full name and address of the writer. Unless specially desired, only initials will be printed. We invite criticism and comment by the readers of the ENGINEERING AND MINING JOURNAL. Replies not intended for publication should be addressed to the Editor of the ENGINEERING AND MINING JOURNAL in blank, stamped, and sealed envelopes. We do not hold ourselves responsible for the opinions of our correspondents.]

The Concentrating Works of the Hecla Consolidated Mining Company at Glendale, Mont.

EDITOR ENGINEERING AND MINING JOURNAL:

SIR: To Mr. F. de Stwolinski's letter I desire to reply by the following statement of facts:

"Dynamical Metallurgy" is the head under which has been published in the *Mining Record* the article objected to by Mr. de Stwolinski. It states that a series of perforations used at the Glendale Works were faulty and not appropriate, changing for no existing cause whatever in rate between 1 : 1·379 to 1 : 2, varying through modifications between each two from step to step. It staes at the same time that in place of 1 : 2 : 3 25 : 5 : 7·25 : 10, as the mill description published had it, it should be as 1 : 1·33 : 1·75 : 2·33 : 3·25 : 4·25 : 5·66 : 7·5 : 10, on account of the rational causes existing, and fully shown from their determination. Mr. Stwolinski now states them to be as 1·5 : 2 : 3·5 : 5 : 7 : 10. In Mr. Stwolinski's description of the mill, both inches and millimeters were stated, and they tally. The pretended correction, after I had shown the sole correct rate between diameters to be in the premises as 3 : 4, looks suspicious on its face. But even were it true, it does not go far enough, and I can only repeat my former statement: "Whatever satisfaction the Glendale mill may give to those working it, there is no doubt but that it can be made to do better."

In Missouri, more than twelve years ago, I built and operated a concentration mill, which did as well as and somewhat better than all contemporaneous establishments of the kind, as long as I conducted it. When I left, to construct one in other parts, I had a successor, and under him the establishment failed, for which I was very sorry on account of the owners and of the cause of ore-dressing. Nevertheless I admit, that since then I have learned a good deal, and would with pleasure learn to-day after the long years spent on my specialty, but I must decidedly doubt by what Mr. Stwolinsky says, that it would benefit me any to accept his invitation "to spend some years" or even a day, "on some works" he has "constructed" other than to learn "how not to do." Very respectfully,

ELY, VERMONT. F. M. F. CAZIN.

Duncan Concentrators vs. Frue Vanners.

EDITOR ENGINEERING AND MINING JOURNAL:

SIR: In your last issue, Mr. Walter McDermott makes some statements regarding the test between the above-named machines, at the Carlisle mill, Grant County, New Mexico, which may have created a false impression, if not corrected, namely, "That a gold pan is of little use, even in the most experienced hands, except on gold amalgam. So much as to the probabilities in case of a test on stamp mill tailings between a pan machine and a belt machine, when finely divided sulphurets have to be saved," perhaps leading the public to believe that the Duncan concentrator is simply a gold pan.

I hardly think that Mr. McDermott will question the authenticity of the statement of Col. I. E. James, that the ore treated contained, besides gold and silver, sulphides of lead, zinc, iron, and copper, and hence would be considered a most refractory ore, so that his statement that a pan concentrator "is of little use" falls to the ground, considering the fact that six Duncans (pan concentrators) save on the run of 18 days 19½ hours, and on 694¼ tons of ore (fed from the same ore-bins to both machines), $123.27 gold and $600.18 silver in excess of the vanners, notwithstanding their vaunted superiority. In the contract of the vanner people with the Carlisle mill we have no interest. The mill company may not yet be ready to return them for many reasons. It is not denied that the Frue vanner may be very valuable for some uses; but the fact remains the same, that in this competitive test, at which the Frue people had, during a portion of the time, their very best men watching the working, while the Duncan had not a single person in their interest, the results then obtained were made by impartial, critical parties, who were only interested in obtaining the best returns.

The Frue vanners have been before the public for some time, and have doubtless pleased their owners for want of something better; but the spirit of American enterprise keeps moving forward, and although many vanners are now in use in California and elsewhere, it is too much to say that something better may not be discovered.

We have no desire to belittle or cry down any machine. We leave the public to judge of the facts as presented. We went into this competitive test with some misgivings, for our machines had been run on entirely different classes of ore; but the results exceed our most sanguine expectations. Had this test been made by us alone, there might have been some room for doubt: but at the Carlisle mill, under the immediate eye of Colonel James, who is known the length and breadth of the Pacific coast as a practical mill-man, than whom there is none more experienced, we feel satisfied that every thing connected with the trial was conducted with the spirit of perfect fairness to both machines, and that the Duncans having exceeded the Frue in the quantity of concentrates, and increased value of gold and silver saved, proves them to be the machine long looked for for this class of work.

"As to the amalgam tests, the vanners were not ordered for saving this." Neither were the Duncans. That valuable feature was developed during the trial, and every mill-man and person who has worked about gold mills where the pulp passes over copper plates, or in silver mills where it leaves the settlers, knows that the plan of riffles has been an almost entire failure to save all the amalgam, in no matter what form.

We are now putting the Duncan concentrators into several mills in Arizona, and in Eldorado and Amador counties, Cal., and shall be pleased to place them at any time beside the Frue, wherever they may be, and believe in the motto, "May the best win." Very respectfully,

HENRY B. MURRAY,
Agent for Pacific Iron-Works, San Francisco and Chicago, Manufacturers of Duncan Concentrators.

THE PHILADELPHIA MEETING OF THE AMERICAN INSTITUTE OF MINING ENGINEERS.—II.

THE THIRD SESSION,

held on Wednesday afternoon, was opened by a valuable paper by Mr. John Fulton, mining engineer of the Cambria Iron Company:

COAL MINING IN THE CONNELLSVILLE COKE REGION.

The Connellsville coal-field is a separate strip of the upper coal measures, flanking the Chestnut Ridge along its western side. It extends from a point a few miles south of Uniontown, in Fayette County, following a northeasterly course parallel with the track of Chestnut Ridge Mountain through Fayette and Westmoreland counties, with its terminal prongs resting on the southern portion of Indiana County north of the town of Blairsville.

This belt of coking coal will average about three miles in width and over sixty miles in length, affording nearly, if not quite, two hundred square miles of this large coal-bed. It is a shallow synclinal, with slopes of from two to three degrees, moderating downward toward the middle of the basin. Sufficient leveling has not been done to ascertain the position of the axis line of this large basin. The indications are, from what is known, that its structure will harmonize with the general law of the Appalachian region—a rise along its axis line northeastward. But this law is never uniform over long distances, as the bottom of all basins is interrupted by "swamps" and summits, resulting mainly from the variableness of dips along their course, or rather from the forces that formed these dips.

The mine workings of this region are confined to the one principal seam, the Connellsville, or Pittsburg coal-bed. It is found here under its best development as regards size. Its quality of coal is peculiarly adapted to the great industry of the region, coke-making. This large coal-bed possesses a remarkable uniformity of thickness over the whole field, affording from eight to nine feet of coal, and seldom getting below seven feet in thickness. The coal-bed is underlain by fire-clay, and has a roof of carbonaceous slates and shales. This roof, for a hight of from eight to sixteen feet above the coal-bed, is sliced into blocks by cleavage planes, rendering it quite brittle and easy to let drop in short sections. This condition of the roof governs the width of all its headings and rooms. A portion of the upper bench of the coal-bed, from six to twelve inches, is usually left attached to the roof for the purpose of stiffening it, and also to prevent its raveling down in the mine-ways and room-workings.

The coal is quite soft and easily hewn down as the bed is slashed with planes into thin plates, nearly at right angles to the bedding plane. No "bearing in" or undercutting is required, merely a cutting down or excavating process being needed. The coal is bright, and mines into small pieces or "fine coal." The following analyses, from very careful sampling, will show its general character:

ANALYSIS OF CONNELLSVILLE COAL. T. T. MORRELL, CHEMIST.

	Cambria Iron Co. Morrell Mine.	Morewood Mine.	Herold Mine.	Rintz Mine.	Saxman Mine.
Moisture	.....	1·020	1·260	0·79	1·02
Fixed carbon	60·30	58·880	60·790	56·46	58·25
Phosphorus	0·01	0·011	0·013	0·02	0·03
Sulphur	1·09	0·805	0·670	1·32	1·42
Volatile matter	31·38	32·270	28·830	31·91	32·07
Ash	7·24	7·010	8·440	9·52	7·24

In comparing the composition of coal across the Appalachian field in the western section of Pennsylvania, it will be noted that the Connellsville variety occupies a peculiar position between the rather dry semi-bituminous coals eastward of it, and the fat bituminous coals flanking it on the west.

ANALYSES OF COALS FROM THE UPPER COAL MEASURES IN A WESTWARD ORDER.
A. S. M'CREATH, CHEMIST.

Localities.	Moisture.	Fixed carbon.	Phosphorus.	Volatile matter.	Ash.
Anthracite	1·35	89·06	0·30	3·45	5·81
Cumberland, Md.	0·89	74·28	0·71	15·52	9·29
Salisbury, Pa.	1·66	68·77	1·24	22·35	5·96
Connellsville, Pa.		60·30	1·09	31·38	7·24
Greensburg	1·02	61·34	0·86	33·50	3·28
Irwin's	1·41	54·44	0·64	37·66	5·86

ANALYSES OF COALS FROM THE LOWER COAL MEASURES IN A WESTWARD ORDER.
MORRELL AND M'CREATH, CHEMISTS.

Localities.	Moisture.	Fixed carbon.	Sulphur.	Volatile matter.	Ash.
Anthracite	1·35	89·06	0·30	3·45	5·81
Broad Top	0·77	73·34	1·02	18·18	6·69
Bennington	1·40	61·84	2·60	27·23	6·93
Johnstown	1·18	74·46	1·86	16·54	5·96
Blairsville	0·92	62·22	4·92	24·36	7·59
Armstrong County	0·96	52·03	3·66	38·20	5·14

This special position and condition of the Connellsville coal-bed for coking has made the region famous. It is, in fact, the Durham of America. Beneath this Connellsville or Pittsburg coal-bed, an interval of from 400 to 600 feet of barren measures separates it from the lower productive coal measures of Western Pennsylvania.

The two preceding tables show the great similarity in composition in the coals of these upper and lower coal measures in the same geographical belt or basin. This should afford the Connellsville coke producers a large additional supply of coal from the beds in the lower coal measures.

Along the flanks of the basin, this large Connellsville bed comes to the light in places along the hillsides, forming steep escarpments. These massive outcrops early invited attention to the presence of this coal. A large number of "country bank" coal mines are still found along the outcrop edges of the basin. They have been and are now worked in a very primitive way with appliances of great antiquity. But for the discovery that this coal was admirably adapted for coke-making, the region might have remained in its original obscurity. In 1841, Provence McCormick and James Campbell, two carpenters, learned that coke-making might lead to profitable results. By their enthusiasm, they interested John Taylor, a worthy stone mason, who owned a tract of coal land, and who was engaged in coal mining at this time. These three formed an industrial "pool." Taylor, the stone mason, was to build the coke-ovens, and the carpenters, McCormick and Campbell, were to build two arks to convey the coke by water to Cincinnati.

In the spring of 1842, the fleet of two arks, carrying 1000 bushels of coke each, or 40 tons in all, reached Cincinnati safely. But they found, to their amazement, that this new fuel was almost unknown to the iron founders of that city, who, when canvassed for its purchase, regarded it suspiciously, contemptuously denominating it "cinders." A portion of the cargo was traded for groceries at unprofitable rates, and the remainder shipped in canal-boats to Dayton, Ohio, where Judge Gebhart, the owner of a foundry, used the coke and recognized its superior value in iron melting.

After the completion of the Pittsburg & Connellsville Railroad, Connellsville coke was shipped to Pittsburg and tested in the blast-furnace of Graff, Bennett & Co., where its high quality was first firmly established in 1859. An attempt to substitute coke made from Pittsburg coal near the furnace proved unsatisfactory, and the Connellsville coke was again used. This test gave the first impetus to mining for coke-making in the Connellsville region—so much so that 30 new ovens were built in 1860!

The following statement exhibits the progress of mining coal and coke-making:

In 1841, the number of coke-ovens was	2
1850, " " " "	4
1860, " " " "	70
1870, " " " "	550
1879, " " " "	4,200
1884, " " " "	10,364

The amount of coal mined and used for coke-making in 1879 was 3,222,306 net tons, from which 2,013,941 net tons of coke were made. This was 73·17 per cent of all the coke made in that year in the United States. If all the ovens in the region could be kept in use during the present year, 1884, the consumption of coal would be 8,102,880 net tons, yielding 5,064,300 net tons of coke. In addition to the coal used for coke-making, from 100,000 to 150,000 tons are now annually shipped for other purposes, making the total coal required from the mines when all the ovens are in operation nearly 8,500,000 tons. Taking the product of an acre of coal at 13,500 tons net, the present annual requirement of full work would exhaust the coal from a square mile of this territory each year.

The early methods of coal mining for coking consisted mainly in slopes following the coal-bed down its dip toward the bottom of the basin. The adits or main headings were usually driven at right angles to the "slope." "Butt" headings were driven from the adits at angles, to insure moderate products across the floor of the coal-bed; from them, rooms were laid off mainly parallel to the adits. The rooms were made of a width to meet the tenacity of the roof, usually from 10 to 14 feet. The "ribs" or pillars were from 8 to 12 feet thick.

From the beginning of mining operations until the year 1882, little attention was given to exhaustive mining. The coal-pillars or "ribs" were as narrow as possible in the direct working of rooms. When these rooms had been driven to their full length, then, in coming back, the ribs were further reduced by cutting along their flanks, or by cross-cuts through the pillars, the remainder gradually splintering down. The entire loss was from 20 to 40 per cent of the coal. A very large area of this fine coal-bed has been lost in this way. In the sections of the coal-fields where the covering is light, the presence of these lost coal-pillars can be plainly traced as ridges.

During the year 1882, a revision of the previous wasteful methods of mining was carefully considered, and some of the companies adopted the plan of exhaustive mining by withdrawing the coal-pillars between rooms on the latter reaching their full length. Taking the available thickness of coal on this bed at 7½ feet, an acre will yield in round numbers 13,500 net tons. By the old system of mining under its most favorable conditions, about 33 per cent of the coal was lost in ribs or pillars. This loss would be 4455 net tons per acre. Estimating the coal at a royalty of 9 cents per net ton, this exhibits a loss of $400.95 per acre!

On the other side, the owners of coal lands generally do not own the surface of the land, which is quite valuable for agricultural purposes, selling for $100 an acre. Any mining operations displacing this surface or injuring it for farming purposes would render the miner liable to damages. Wherever 100 feet or upward of covering is found over the coal-bed, very little if any disturbance of the surface follows, as the greater space occupied by the breaking up of the roof, slates, and sandstones compensates for the coal space removed. But anticipating the worst condition of shallow covering, and placing the damage by breaking up of the surface at $30, a balance of $370 would remain to reward exhaustive mining. When other sources of economy are considered, the hauling out of the pillar coal over the room-tracks, previously laid down, the saving of props, and the improved condition of air by confining it to actual workings, at least $400 per acre should be saved by exhaustive working.

Two general methods are now in use in the work of drawing coal-pillars. The first consists in hewing the coal on the face of the pillar, the miners being protected by a double row of props, which arrest the falling of the roof and prevent the tailing of falls of the roof from encumbering the mining face. As the mining advances, the line of props next the goaf is moved to the front rank, and the work of alternating the two lines of props is continued until the pillar has been withdrawn. The props are placed two or three feet apart, and the two lines are about three feet apart. This double line of protecting props is extended sufficiently far across the room-working to prevent the roof from coming down too far in advance of the line of mining face of the pillar-working to encumber the loading of coal into cars near the end of the track.

The second method consists in protecting the miners by a single row of props placed from six inches to one foot apart near the working face of the coal-pillar. This not only arrests the breaking down of the roof in its usual plates and blocks, but holds back the slope of the goaf from interrupting any of the mining operations. The miners attack the coal-pillar under this system on the flank in place of the end, removing it in sections of from five to eight feet in length. When each section has been removed and the track lifted, these fender-props are removed to a new line close to the coal face or end of the pillar. The superior safety of this plan is apparent. The props hold the roof steadily at one fixed line until the section of the pillar in advance of it has been removed.

In both of these methods, causing as they do the breaking down of the roof, it has been found expedient to require the miners to use safety-lamps to guard against explosions from sudden outrushes of gas from the breaking roof. The character of the roof slates in the Connellsville region is such as to insure easy execution to this method without involving any additional charges to the miners. No accident has yet occurred in drawing the pillars in the large mines of the Cambria Iron Company.

The same system of removing coal-pillars between the rooms in a mine can readily be applied at the proper time to the withdrawing of the coal-pillars alongside the level or adit headings, the butt headings, or other ways of the mine.

As the safety and economy of this system of exhaustive mining have been fully established during the past two years, it is to be hoped that all mining in this valuable bed of coking coal will in the future participate in the benefits arising from the drawing of coal-pillars and in its related economies.

During the discussion, in which Messrs. K. A. Jones, Dr. Raymond, and Dr. Chance took part, the fact was elicited that the saving by the new system in the cost of mining amounted to about two cents a ton.

Mr. A. E. Lehman, of Philadelphia, then described an improved protractor, embodying his modifications of the Ege-Walter protractor.

This was followed by a paper by Mr. N. Lilienberg on the methods of manufacturing fire-brick in Sweden. In the course of the discussion, Mr. Durfee, of Bridgeport, Conn., gave a description of a method used by him of making a solid roof for a reverberatory furnace in which steel was heated and melted. He mixed powdered fire-brick with a little fire-clay, and, after saturating it with a solution of common salt, rammed it one foot thick. This roof did excellent service.

The last paper presented at the session was a very elaborate one by Professor S. B. Christy, of the University of California, on the methods of quicksilver reduction at New Almaden, which we shall make room for in a future issue.

THE DENVER EXHIBITION.

EDITOR ENGINEERING AND MINING JOURNAL:

SIR: The National Mining and Industrial Exhibition was opened September 1st. Denver business men manifested their interest in the event by suspending business during the afternoon, and getting up an excellent parade representing their trading interests. Much taste and skill were displayed. Opening speeches were made by Governor Grant and others to a large crowd in attendance. Altogether, the opening is much more auspicious than heretofore.

The exhibits are not quite all in place, but they soon will be. The space is all taken. The nature of the exhibits is much more varied than in the two preceding years. The mineral exhibit is much smaller than formerly. This is a natural result of the apathetic attitude of Denver people last year. It discouraged some of the outside counties and neighboring territories, so that they have either no exhibit at all or lighter exhibits than in either of the former years. A model coal mine is about the only new object of interest in the whole department of mined products.

The machinery exhibit is not well in yet. Among the firms represented are: The Hendey & Meyer Engineering Company, of Denver, which furnishes the 100 horse-power engine that runs the rest of the machinery of the building; also four smaller engines, two hoisters—a large one and a small one—a set of Cornish rolls, and a crusher; the National Tube-Works Company, of Denver and South Pueblo; the Hendey Manufacturing Company, of San Francisco; the Lane & Bodley Company, of Cincinnati, Ohio; the Gautier Steel Department of the Cambria Iron Company; and Davis Creswell & Co., of Denver. All have creditable exhibits.

The large body of exhibits remaining is of little interest to the mining public. It is of the widely varied nature common in Eastern exhibitions. Later on, there is to be an extensive exhibit of the stock interests of the West.

F.

DENVER, Sept. 8.

AMALGAMATING MILLS.—III.*

PAN AMALGAMATION.

PLANT.—The number of pans required in a mill in proportion to the number of stamps is governed by the character of the battery (whether it is wet or dry), the quantity of ore crushed by the battery in a given time, the time required to amalgamate the ore, and the size of the pans to be used. In wet-crushing mills, the proportion varies from two pans to every five stamps to two pans for every stamp. This latter is the case at the Leeds mill, at Silver Reef, in Utah. Generally from two to three pans, holding from 3000 to 4000 pounds, are required for every five stamps. In dry-crushing, two pans to five stamps are always sufficient, unless the pans are small or the ore is very easily crushed, and sometimes one large pan can be made to do the amalgamating for five stamps. In mills recently built, one settler is allowed for every two pans. In the Star mill, at Cherry Creek, and at the Manhattan, in Austin, there is a settler for each pan. This is probably unnecessary, as roasted pulp is very easily settled.

Agitators are in use on the Comstock, at Bodie, and in some other placers, but they are not generally employed. The object in using them is not only to catch the amalgam that may sometimes escape the settler, but to save the coarse sand or concentrations that have been but imperfectly worked in the pans. The agitator is also a convenient receptacle for sweepings and metaliferous refuse. Where agitators are used, the proportion is one agitator to every five or six settlers. A clean-up pan is always needed in a mill; for in it the amalgam from scraping the pans, mullers, and old castings can be separated from the pulp and sand with which it is mixed. It is also very convenient for cleaning quicksilver. But few mills have pans used especially for working tailings. Hydraulic strainers are not often found away from the Comstock. They are a great saving in handling large quantities of amalgam. Usually one retort and one melting-furnace are sufficient for a 10-stamp mill. For raising the quicksilver from the settler to the pan, floor-pumps, cup elevators, and hydraulic elevators are in use in the larger and better mills. In small and old-fashioned mills, the quicksilver is returned to the higher level in buckets by hand; but the hydraulic elevator is superseding all others, because, from the simplicity of its construction, it is not liable to get out of order. It consists of a strong reservoir, into which, the quicksilver having been admitted, a column of water is turned on, forcing the quicksilver through a pipe to the floor above. If water pressure is not to be had, steam from the boiler, usually supplied at about 90 pounds pressure, will answer the same purpose.

PANS FOR WORKING ORE.—The pans used in amalgamation have a capacity of from 1500 to 4000 pounds, and are of various construction. One only of them will be described,† the "combination," which, with its various modifications, is the one most employed in silver mills. When this pan is used for working free ore, the sides and bottom (the latter perfectly flat) are cast in one piece. The sides flare slightly upward, the top being an inch or two larger in diameter than the bottom. A cast-iron cover is made to fit the top closely, and in this there is a hole, with a cover, through which the charge is introduced. The bottom of the pan is either provided with slots to receive the lugs of the dies, or with a false bottom of cast-iron about an inch thick, provided with openings for the lugs that hold the dies in place. The bottom of the muller is flat, and also contains slots, in which the lugs of the shoes are fixed. There are three wings or flanges placed at the top of the pan at equal distances on the circumference. When the muller is in motion, the pulp is thrown to the outside of the pan, and, rising to the top, strikes against the wings, by which it is projected to the center, where it again falls to the bottom. In this way, a complete circulation is obtained, the pulp not only flowing around the pan, but receiving a motion from the outside to the inside and downward, and from the inside to the outside and upward, thereby inducing an intimate mixture between the pulp and the quicksilver. When it is necessary to grind the pulp, the muller is lowered by means of a screw in the top of the sleeve until the bottoms of the shoes just touch the tops of the dies. Some of the other pans in use also give a fair motion to the pulp; but for convenience in handling and quality of work, the combination pan up to the present time has best fulfilled the conditions for the amalgamation of silver ores.

Where this pan is used for working roasted ores, its construction is somewhat different. The bottom is of cast-iron, wooden staves are used for the sides, and the cover is made of wood. The die, instead of being in several pieces, is cast whole, completely filling the bottom of the pan; the shoes and muller are one casting, and as little metal is exposed as the necessary construction of the pan will permit. This is for the purpose of reducing as much as possible the action upon the iron of the acids and acid salts, frequently present to a greater or less extent in roasted pulp. Pans for working raw ore are also sometimes made with wooden sides, this, under certain conditions, being a cheaper construction. In the combination pan, the number of the shoes is from six to twelve, and they weigh from 500 to 800 pounds, and are from two to three inches thick. The dies are similar in number, weight, and thickness. In some mills, as at Austin, when the shoes are worn off the mullers, they are replaced by wooden ones, which answer the same purpose as the iron, the object being to give motion to the pulp and not to grind.

As a novelty, it may be mentioned that in a certain mill in Arizona glass shoes and dies and a wooden muller are used. The muller has copper and iron plates fastened to it (said to be for the purpose of furnishing electricity); but the whole affair is reported to be a failure, and is cited merely to show what extraordinary pans are sometimes constructed.

METHOD OF HEATING PANS.—The usual method of heating pans is by injecting live steam directly into the pulp by means of an iron pipe that descends near the outside of the pan to within six or eight inches of the bottom. This method is unquestionably the best, but it has its disadvantages, of which the diluting of the pulp and the continual wearing away of the pipe are the greatest. This latter is particularly the case with roasted ores. In Virginia City, where the pulp is run thin, the slight dilution caused by steam is of little importance; but in places where it is necessary to keep the pulp thick, it is inconvenient. It is less objectionable in working free than in working roasted ores; for there are many kinds of the latter which, although they may be charged into the pan so thick that they check the motion of the muller, yet in the course of half an hour or so, the different salts having dissolved, become so thin that, with the consequent rapid circulation, they slop over, and this without the addition of steam. The effect of running roasted ore as a thin pulp is to a great extent counteracted by the fact that roasted ore, being easy of amalgamation, does not require the quicksilver to be so finely divided and so intimately mixed with it as is the case with raw ores.

Another method of heating is by means of a steam-chest under the pan, and more rarely by means of a jacket, in which exhaust-steam may be used. It is only with the freest ores that it is safe to heat pans in this way, and even with such ores the pans frequently leak into the steam-chest. The reason for this is plain: the action between the salts (whether in the shape of chemicals added to the ore or formed in roasting) and the iron of the pan will be strongest at the hottest point, namely, the bottom of the pan, and should there be a defective spot in the casting, a hole would soon be eaten through. In Bodie, this method is used, but the conditions are favorable, as the ores are free.

NUMBER OF REVOLUTIONS OF PANS PER MINUTE.—Pan mullers generally make from sixty to ninety revolutions a minute. It is true that the faster the muller is run, the more work is done in a given time; but questions of wear and tear of machinery have thus far usually limited the speed to ninety revolutions. The pans at the California mill are geared to run ninety-five revolutions.

WEIGHT OF CHARGE.—A pan charge weighs from 1500 to 4000 pounds, according to the size of the pans. A 4000-pound pan is 5 feet 6 inches in diameter, and 30 inches deep. In working rich ore, the charges are generally smaller than in working low-grade pulp.

TEMPERATURE.—The temperature maintained in the pan has much influence upon the amalgamation of the ore. The effect of temperature on the amalgamation of the base metals, lead, and copper, is not very well understood, and it can only be determined by careful and exhaustive experiments. It seems to be a well-established fact that, in the amalgamation of chloride ores that carry a considerable percentage of carbonate of lead, a fine bullion may be obtained without an appreciable loss of silver, by keeping the temperature of the charge considerably below the boiling-point (say at 120 degrees Fahr.). At exactly what temperature it will be necessary to keep a given kind of pulp, experiment alone can show. Time, as before mentioned, has also an influence on the results. The reason for the earlier amalgamation of the silver at a temperature of 100 degrees Fahr. or thereabout seems to be that the conversion of the carbonate into the chloride of lead (the form in which it is necessary for the lead to be in order to be precipitated by the iron and amalgamated by the quicksilver) takes place much less readily at a temperature of 100 degrees Fahr. than it does at 200 degrees Fahr. Were the conditions entirely uniform, the metals would be amalgamated in the order of their electro-negative properties; that is to say, first silver, then copper, and last lead; but in practice this is not the case, as unquestionably lead is amalgamated at the same time as the silver. The reason is, that the pan and the pulp do not furnish all the conditions of a true galvanic cell. For instance, it is possible to conceive of a particle of carbonate of lead, not in conjunction with a particle of chloride of silver, coming into contact with the iron of the pan in the solution of salt or salt and bluestone, as the case may be. Under such circumstances, the particle of carbonate would be converted into chloride, and metallic lead would be precipitated and amalgamated.

It is customary to keep roasted ore at a temperature of 200 degrees Fahr. At the California mill, the pans are heated to 150 degrees Fahr.

TIME OF WORKING A CHARGE.—The time for working a charge is from five to eight hours. It is largely governed by the value of the ore. With any given ore, experience shows how far it is profitable to prolong the amalgamating process, which proceeds more and more slowly as the silver is taken up. In many cases, where a comparatively small portion of the silver is extracted by pan amalgamation, this is not due to the imperfection of the process, but to the fact that, under the local economic conditions, it is not profitable to continue the process until a large percentage is saved.

CONTINUOUS AMALGAMATION.—A system of handling ore in wet-crushing mills, known as the "Boss" process, has been introduced at Bodie, which dispenses with the laborious work of shoveling the pulp from the settling-tanks. The ore is, as usual, crushed in a battery, but with as little water as possible, and the pulp is thence conducted to the first of a series of pans in which the mullers are revolving. From this pan, it flows to the next, and so on through the series, until from the last pan it passes through a series of settlers, and finally from the last settler out of the mill. The pans are heated by steam in false bottoms, so that the pulp is not thinned. It becomes thicker as it progresses. The chemicals are added in the first pan, and the quicksilver is added at a stage when the pulp is thick enough to hold it.

GRINDING.—When ores are submitted to chloridizing-roasting, grinding is scarcely necessary, because the silver chloride passes into the solution, and to some extent this is also true of raw chloride ores; but with all other ores, a finer comminution than can be attained in the battery is probably essential to effectual amalgamation. As a rule, the muller is kept down about half the time necessary to work the charge. During this period, chemicals, such as bluestone and salt, if added, are supposed to have produced their full effect, and at the close of it the quicksilver is added. After the addition of the quicksilver, the shoes are usually raised from the dies, to avoid the flouring of the quicksilver by excessive mechanical division in the presence of more or less adherent substances. At the California mill, it is true, grinding is continued throughout the entire treatment in the pans, and it is said with satisfactory results. This practice seems to carry great authority, because the usual method was formerly pursued under the same management. Possibly, however, the charge of the pans at this mill contains less adherent material than is ordinarily the case; it is certainly less base. Grinding, after the addition of quicksilver, is especially objectionable if lead is present.

It is asserted by some mill-men of experience that grinding is unnecessary with silver ores unless they contain a large proportion of gold, and there is no doubt that finer bullion is obtained when the ore is not ground; but gold is more readily amalgamated than silver, and, if grinding is desirable where gold is present, it is difficult to avoid the conclusion that

* From the Census Report by G. F. Becker and S. F. Emmons. Compiled chiefly by Mr. J. S. Curtis.

† For a history of the Washoe pan and its varieties, see *Exploration of the Fortieth Parallel*, vol. iii., Mining Industry, by J. D. Hague.

it is still more essential when the ore is purely argentiferous. Thus 76 per cent of the assay value of the gold contained in about 300,000 tons of Hale & Norcross ore during the eight years ended January 31st, 1874, was saved by amalgamation, while only 61 per cent of the silver in the same ore was extracted. As is the case with almost all technical operations, local economic conditions determine the extent to which grinding is profitable; but experiments to decide such points are too often omitted, or conducted under the bias of preconceived opinions.

QUANTITY OF QUICKSILVER ADDED.—To effect a separation between the pulp and the amalgam, it is essential that a certain volume of quicksilver should be added in the pans, for otherwise the amalgam would not gather at the bottom of the settler. Not less than 100 pounds of quicksilver to the ton of ore appear to be sufficient for this purpose; and for the ordinary pan, constructed to treat two tons of ore at a time, the minimum charge of quicksilver is consequently, as a rule, 200 pounds, and this only when the ore is free and of low grade. When the ore is rich, a further addition of quicksilver is made. The proportion of quicksilver to silver in the fluid amalgam should never be less than a pound to the ounce, however rich the ore may be. In working free ore, the quicksilver is added from two to four hours after charging; but with roasted ores, it has become the custom to add the quicksilver at once upon charging; and experience has shown that, when this plan is adopted, amalgamation is more complete, while the loss of quicksilver is not increased.

CHEMICALS USED IN AMALGAMATION.—The list of chemicals used in the amalgamation of silver ores is growing smaller year by year. At present, except in a few isolated cases, the only chemicals employed in working ores raw are salt and bluestone. The reactions which take place in pan amalgamation have been but little studied; indeed, chemists have not yet reached definite conclusions as to the essential reactions of the patio process, a subject to which a number of elaborate investigations have been devoted. There seems little question that the use of bluestone and salt accelerates the reduction of argentite. The sulpho-salts of silver are also attacked, but are either only partially decomposed or so slowly reduced that it is not as cheap to treat them raw with chemicals as to submit them to a preliminary chloridizing-roasting.

There is no exact rule in use governing the quantity of bluestone and salt added, though larger quantities of chemicals are usually employed in working high-grade ores than in treating poor ones. The baser the ore, the more bluestone and salt are commonly considered requisite; but the quantity of each can only be increased to that amount that will result in a yield of silver corresponding to the cost of the extra weight of bluestone and salt employed. There can be no doubt that much money has been wasted in the unnecessary and ineffective use of chemicals. The proportion that salt ought to bear to bluestone is another point, which, although of the greatest importance economically, is not well understood. Most mill-men use more salt than bluestone, but others more bluestone than salt. On the Comstock, where experiments have been conducted for many years, the proper quantity of bluestone and salt, and the proportion of the one to the other to be used with any grade of the ore of that district, has been ascertained approximately; but Comstock rules would not apply in general to other ores, though doubtless there are many of substantially the same character. At the California mill, with $30 ore, 2 pounds of sulphate of copper and 6 pounds of salt are used per charge of 2 tons; with $80 ore, from 10 to 12 pounds of bluestone and 20 pounds of salt. The chemicals are added on charging. Modifications in the Comstock practice depend on the baseness of the amalgam, the tailings assays, and the appearance of the quicksilver.

As a curiosity, the following list of chemicals that are used in a mill in Arizona may be mentioned: One and a half hours after charging, 20 pounds of salt, 3 ounces of cyanide of potassium, 2 ounces of sulphuric acid, 1 ounce of nitric acid, 1 ounce of hydrochloric acid, and ¼ pound of carbonate of lime. The superintendent does not profess to know what reactions are produced. In some of the mills at Bodie, hydrochloric acid and carbonate of soda are used. This is equivalent to an addition of salt. In districts such as White Pine, where silver occurs almost entirely in the form of chloride, little or no bluestone is required.

When grease has got into the pans, caustic potash, soda, ashes, or cyanide of potassium is added. The latter is also used upon the quicksilver in the tubs to keep it clean. Caustic lime is sometimes used with roasted ores containing a great deal of cupric chloride. It forms chloride of lime, reducing the cupric to cuprous chloride.

Sodium amalgam is found to be useful in amalgamating ores that contain the binoxide of manganese, as it prevents the flouring of the quicksilver which that mineral occasions.

Two noteworthy cases of a waste of chemicals are reported, in one instance the use of copperas in pans with roasted ore, and in another the use of bluestone with roasted ore, which already contained dichloride of copper.

Chemicals are added on charging, with the exception of caustic potash, soda, etc., which should be added with the quicksilver, which they are designed to keep bright.

At Dayton, where large amounts of the Comstock tailings are saved and worked, it is customary to add sulphate of copper in acid solution in large quantities, sometimes as much as the equivalent of 30 pounds of bluestone, when it is found that the loss of quicksilver exceeds the usual quantity. The Comstock tailings contain a very large proportion of clay, and the loss of quicksilver is probably in great part a mechanical one. The clay is said to "ball up" and carry off globules of quicksilver. The acid sulphate probably acts on the clay very much as alum does, promoting its precipitation.

USE OF IRON IN THE PANS.—Iron is one of the important factors in the amalgamation of silver ore. It is used in various forms; in the first place, as cast-iron in the material of the pans. As wrought-iron in the form of rings, it is sometimes put in the pans, and it is occasionally added to the charge in the form of shavings, filings, etc.

In working free ore, much less iron is required than in working roasted ore, and the ordinary wear of the battery and the pan is generally sufficient. One pound of iron will precipitate 3·85 pounds of metallic silver from the chloride; but in practice more than that amount of iron is consumed where there is copper either naturally present in the pulp or added in the form of bluestone. Carbonate of lead is also believed to increase the consumption of iron.

With roasted ore, much more iron is required; and where there is a great deal of lead and copper present, sometimes as much as 20 pounds of iron to the ton are consumed, not including the iron needed to precipitate the silver. The best form in which to use iron in the pans is as wrought-iron filings sifted as fine as possible, but such filings are expensive and difficult to obtain. The turnings from a lathe are the best substitute. These wrought-iron fragments protect the cast-iron of the pan to a great extent from the corrosive action of the different salts in the roasted pulp, as they are more readily dissolved, thus relieving the pan itself from a large amount of loss.

At the Manhattan mill, in Austin, 10 pounds of iron turnings are used to the charge, and they are almost completely consumed. Four pounds of this iron would be sufficient to precipitate the silver; the other portion, as well as the iron from the pans, is probably employed in decomposing lead and copper salts.

LOSS OF QUICKSILVER.—The usual loss of quicksilver runs from half a pound to 3 pounds to the ton of ore treated. A reasonable limit of loss in present practice is 1½ pounds per ton. The waste is in part owing to the difficulty of completely separating the quicksilver from the sand in the settler, and this is particularly the case with ores that contain carbonate of lead or other heavy minerals. To counteract this mechanical difficulty, agitators are sometimes used; riffles and blankets in the sluice-boxes from the settlers are also occasionally employed. In ordinary cases, sufficient separation can be effected in the settler by the proper arrangement of the shoes on the muller and the regulation of the speed of rotation, but a certain amount of quicksilver is no doubt always carried off in minute globules.

A second cause of the loss of quicksilver is the formation of lead and copper amalgams in the treatment of ores containing these metals or in working silver ores with bluestone. These alloys are pasty substances, which are rapidly reduced to the finest powder by grinding; in other words, the quicksilver is floured, and the separation in the settler is very imperfect. The most radical cure for this condition of the quicksilver is the addition of sodium amalgam in the pans before the ore is drawn off. Sometimes the loss is not sufficient to warrant the use of this expensive alloy, and in such cases it is better to gather the quicksilver and amalgam together, as well as may be, by prolonged treatment in the settler.

In the patio process of amalgamation, a very large amount of quicksilver is converted into calomel and lost. In the pan process, it is highly probable that one or both chlorides of mercury form to some extent, but these compounds are, for the most part, reduced by the iron. Were this not the case, the loss of quicksilver would be far greater than that actually sustained.

The loss of quicksilver is slightly greater in cold than in warm weather, especially in gold mills. As it is a well-established fact that the process of amalgamation is facilitated by a high temperature, it is not strange that cold should interfere with or retard it.

LOSS OF IRON IN THE PANS.—It is a very difficult matter to estimate the amount of iron consumed in the pans in working a given kind of ore. The aggregate amount of iron worn from shoes and dies, shavings, etc., can be easily determined, but it is difficult to estimate the loss from the walls of the pan itself and from the muller. Where free ore is ground, the iron worn from shoes and dies is from 6 to 10 pounds to the ton. This iron is more than sufficient to fill the chemical requirements of amalgamation, and it is therefore probable that in such cases the iron of the pan and that of the muller are very little acted upon. With roasted ore, however, this is different, and, as it is not usual to grind it, a good part of the corrosive action comes upon the pan and the muller unless iron is added to the pulp in some form or other. This loss of iron can be estimated at from one fifth of a pound where the ore is free, poor, and not ground, up to 25 pounds to the ton where the ore is base, rich, and roasted. At the Martin White mill, at Ward, Nevada, the loss used to be 20 pounds. When free ores are ground in the pan, a considerable quantity of finely divided metallic iron separates from the amalgam in the clean-up pan.

EXPLOSIVE GAS IN PANS.—Explosive gas in the pans has only been reported as met with on the Comstock, and under the following circumstances: When the mill is shut down, and the pulp is allowed to remain standing in the covered pans, an explosive gas of some kind is formed, which ignites when a lighted candle is brought near the charging-hole. Before this fact was well known, several accidents happened that might have ended seriously. A man standing on the pan-cover of a pan in the California mill brought his candle near the charging-hole to see if the muller was moving, as he had just put on the tightener; the gas becoming ignited, he was blown, together with the cover, into a settler. That explosive gas has been noticed only at Washoe, may be due to the fact that the pan-covers fit much more closely there than is usual elsewhere, thus obstructing diffusion. It is difficult to understand how any explosive gas can form in the pans of the California mill. Neither free acid nor sodium amalgam is there employed as a chemical, and the liberation of free hydrogen or hydrogen sulphide is therefore improbable. Mr. H. C. Hahn* asserts that the amalgamation process is accompanied by the evolution of hydrocarbons, but this is difficult to comprehend in the absence of free acids. In short, the matter requires further investigation.

CLEAN-UP OF MILL AND PANS.—In most mills that run regularly there is a general clean-up at the end of each month. A very considerable quantity of hard amalgam adheres to the shoes and dies and fills the interstices of pans and settlers, which is removed when new shoes and dies are put in place. In custom mills, a clean-up is sometimes made when each lot of ore has been worked off, if the lots are of considerable value.

SETTLERS.—The usual size for settlers is a diameter of 8 feet and a depth of 3 feet. Occasionally they are found 9 feet in diameter, and 10-foot settlers are reported in two mills. For ordinary work, a diameter of 8 feet is sufficient. At the Manhattan mill, where a settler is used with each pan, the settlers are 6 feet in diameter.

There are two different kinds of mullers used in settlers. In the mills on the Comstock and some others, the "spider" muller is common. This consists of four arms projecting horizontally from the center of the muller, and upon each one of these arms a shoe, either of wood or iron, is fastened, which serves to plow up and keep in motion the sand at the

*Berg- und Hüttenmännische Zeitung, 1870, p. 65.

bottom of the settler. The other form of muller ends downward in a round disk of iron, which fills the bottom of the settler to within 3 inches or so of its circumference, upon the under side of which long wooden shoes, 3 inches thick, radiating to the outside, are fastened. A settler thus arranged is the best for base ores, as it permits the rubbing and assimilation of the floured particles of amalgam in the bottom of the settler. The muller usually revolves from twelve to fifteen times a minute, although it is sometimes geared to make as many as eighteen revolutions; this, however, is only where very heavy ore is worked, or where the ore has been crushed through a very coarse screen. Such a speed is always attended with more than the usual loss of quicksilver; the greater the diameter of the settler, the less ought to be the number of revolutions of its muller. It is customary to keep a charge in the settler until it is nearly time to discharge a pan into it; that is to say, from two to four hours. It is a much easier matter to settle chloridized pulp than that which has not been roasted; for in the process of roasting the particles of quartz, etc., become porous and friable. They are consequently ground finer, and can be retained in suspension in the water with much less motion of the muller.

It requires from fifteen minutes to half an hour to discharge a settler through the series of holes provided for that purpose. The top plug is, of course, the first to be drawn, in order that the quicksilver may have as long as possible to settle, and to avoid the production of rapid currents, which might carry off amalgam. A more rapid discharge would defeat these objects.

STRAINING-SACKS.—Canvas is the material usually employed for straining-sacks, though in some of the mills at Bodie and other places canton flannel is used for that purpose.

CLEAN-UP PANS.—In many mills, it is customary to pass the amalgam from the strainers to a clean-up pan, as, in addition to sulphurets, iron from the shoes and the dies of the pan is mechanically mixed with it, and it is found more economical to extract these substances before the amalgam is retorted. This process could be introduced to advantage in most mills where it is not now in vogue. A common size for clean-up pans is 5 feet diameter and a depth of 16 inches. They are usually of the Knox pattern.

HOT STRAINING.—As before stated, the base metals that enter into silver amalgam are chiefly lead and copper. For many years, attempts have been made to discover a process by which these metals could be eliminated from the amalgam before retorting. Where there are copper and lead minerals in the ore, it seems impossible to prevent the presence of the metals in the amalgam. A process of hot straining, now almost entirely abandoned, was for some time in use for the separation of lead amalgam. By it two classes of bullion were obtained, one consisting of tolerably pure silver and the other of lead with perhaps 10 per cent of silver. The copper, however, was retained in the silver amalgam, and, partly from mechanical and partly from chemical causes, the loss of quicksilver was considerable. But the greatest objection to the process was the ruinous effect that it had upon the health of the men. Quicksilver, perceptibly volatile at a temperature of 40 degrees Fahr., becomes much more so at 212 degrees Fahr., and to keep large quantities exposed to that temperature, where men can inhale its vapor, is extremely objectionable. A process by which lead and copper can be eliminated from the amalgam is much needed. None is known to be in use at present that satisfies the requirements.

In very cold weather, a gentle heat is sometimes applied to the amalgam before straining. At the California mill, it is customary to keep the straining water at a temperature of 100 degrees Fahr. This facilitates straining, and no evil effects on the health of the men have been noticed.

HYDRAULIC STRAINERS.—These at present are very infrequently used, but they effect a great saving of fuel in retorting. Ordinarily, dry silver amalgam from the strainers, where it is free from base metals, has about seven parts of quicksilver to one part of bullion. When this amalgam is strained under pressure, the quicksilver can easily be reduced to three and one half parts. A pressure of from 100 to 125 pounds to the square inch is used for these strainers.

RETORTING.—The size of the ordinary retort in use is 12 inches in diameter and 4 feet in length inside. It will hold from 600 to 1000 pounds, according to the quality of amalgam and whether the vent is in the center or at the upper edge of the end. It is usual now to cast retorts with the vent at the upper edge of the end, and, if two vents are made opposite each other in the end, the retort can be turned over. This kind of retort is fast superseding the old style, where the vent was in the center of the end. Retorts up to 20 inches in diameter are reported. The retorts at the California mill are 5 feet 6 inches long and 14 inches in diameter; the charge is 1800 pounds. Retorts are sometimes turned either a half or a quarter revolution after a "belly" has formed on the bottom, but generally they do not last long after turning, and the practice is open to strong objections. The retorts are circular in section. Amalgam is not often charged in cups, but is frequently divided by disks of iron, in order to save the trouble of breaking up the bullion for the melting-pot. The retorting of a charge occupies from five to nine hours, according to its size and character. From one sixth to one half a cord of wood is consumed per 1000 pounds of amalgam retorted.

The charge is heated slowly to the boiling-point of quicksilver, and maintained at that temperature until most of the quicksilver has been expelled, when it is gradually heated to a light cherry-red for an hour or so, to expel the remainder. A mixture of salt and ashes is used to swab out the retort and for luting on the head. When the retorting is properly done, the loss of quicksilver by distillation is merely nominal. At the California mill, about one half a pound of quicksilver is lost per 1000 pounds of amalgam retorted. Where the vent is at the upper edge, or the amalgam is not base, or the pipe is kept open by a rod, the vent does not choke. With dirty or base amalgam, there is always danger that the vent may choke if it is in the center of the end of the retort.

An ordinary retort will stand from 100 to 300 charges if properly handled, but in practice the life of retorts is usually much shorter. Steel retorts have been tried, but it was found that they warped too much. The fact that steel burns out sooner than cast-iron would be a sufficient objection to its use.

In some small gold mills, where the amount of bullion produced is not large, simple bulb retorts of cast-iron are used in place of the cylindrical ones. The bulb retorts require no brick fitting, and can be used over an assay furnace or a blacksmith's forge, and are convenient for operations on a small scale.

RETORTED BULLION.—In addition to the gold and silver contents, the retorted bullion of silver mills usually contains lead, copper, and a slight amount of iron.

In retorting amalgam that contains a large quantity of copper, a porous sponge, consisting principally of copper, but containing some silver and lead, is found on the top of the retorted bullion. Wherever the air reaches this porous mass, the metallic copper is converted into oxide. This substance is the bugbear of the melter; for the ordinary temperature of the furnace will not melt and reduce it, but converts it into a plastic mass that no amount of flux seems to affect. This alloy contains from 20 to 30 per cent of silver, and should never be thrown away. A high temperature will reduce and melt it, or it can be roasted, ground, and the copper extracted with sulphuric acid; the residue, consisting of silver and lead, can then be melted into bullion.

Certain alloys of copper, lead, and silver seem to retain a small percentage of quicksilver even after the bullion is melted; how much is not known, but it is sufficient to produce a strong reaction for quicksilver when tested, and its frequency renders the Gay-Lussac wet assay an untrustworthy method for such bullion.

MELTING-FURNACES.—Melting-furnaces are all very similar in construction. They are usually about 16 inches square and 18 inches deep, the top sloping toward the front. The materials are common brick, fire-brick, and cast-iron for doors, etc., with wrought-iron ties.

CRUCIBLES.—A No. 50 or a No. 60 Dixon black-lead crucible is the kind mostly used for melting silver bullion. These crucibles last for from fifteen to twenty-five melts.

FLUXES.—Either slag from assaying, or borax, bicarbonate of soda, and saltpeter, is the flux usually employed in melting. Sometimes sulphur is used where there is much iron in the bullion.

AGITATORS.— Agitators are not very frequently used. Where they are employed, it is more for the sake of concentrating the settler sands, sweepings, etc., than for catching amalgam. They are usually 7 feet in diameter and about 3 feet deep. The assay value of the sands recovered in them is usually higher than that of the tailings and less than that of the ore. Agitators are generally geared to make twelve revolutions a minute.

TAILINGS.—The tailings of free silver ores are almost always saved, those from roasted ore scarcely ever.

Tailings from the battery of a gold mill are handled in different ways, but the following is the usual method: After passing through the screens, the tailings, which contain considerable gold amalgam when battery amalgamation is practiced, flow over an amalgamated copper plate or silver-plated copper plate, on which most of the quicksilver alloy is caught. This plate is as wide as the battery screen and usually from 3 to 5 feet long, and is called the apron. From the apron, the tailings flow into sluices in which are also amalgamated silver or copper plates, alternating with riffles or boxes, for catching quicksilver, and finally reach sluices in the bottoms of which blankets are laid. On these blankets, the sulphurets, which are usually quite rich in gold, are caught. After leaving the blanket sluices, the tailings sometimes run into a concentrator, in which further valuable contents are recovered from them. The Hendy concentrator, the one most employed in California, is usually placed after the plate sluices and before the blankets. Buddles are also often used, as well as the Frue vanner. The blankets used are generally 20 inches wide, and are manufactured for the purpose by woolen-mills in San Francisco. The arrangement of amalgamating and concentrating apparatus in gold mills varies greatly, however; at the Idaho mill, for example, there is no battery amalgamation, and the pulp from the battery is immediately concentrated on blankets. The concentrations are treated in pans, and the tailings from the blanket sluices pass over riffles and other amalgamating apparatus to buddles.

GRADE OF SLUICES.—The grade given to blanket sluices is usually from three quarters to 1 inch per foot, depending on the specific gravity and the fineness of the ore and the proportion of sulphurets contained in it. Sometimes the grade is increased to as much as 3 inches to the foot. The apron used in gold mills has always more grade than the sluices, and in many mills there is an arrangement by which the end of the apron can be raised or lowered as different peculiarities of the ore may demand.

PERCENTAGE OF SULPHURETS.—The percentage of sulphurets in California gold ores is very varied. The average is about 2 per cent. These sulphurets, when concentrated, are worked in different ways. Where rich, the best method is to roast, chloridize with chlorine gas, and leach. One or two per cent of salt added before roasting facilitates the formation of the terchloride of gold and reduces the quantity of chlorine gas required. That terchloride of gold can be made by roasting sulphurets containing gold with salt is a well-established fact; but although at one stage of the process most of the gold is in the form of terchloride, upon cooling this compound is partially decomposed, a portion only of the gold remaining combined with chlorine. In making the chloridation assay of roasted silver ores containing gold, it has been noticed that a portion of the gold is always leached through the filter, showing the presence of terchloride. The cost of such chloridation is about $10 a ton. Where the sulphurets are poorer, they are worked in pans or revolving barrels.

WEATHERING OF CONCENTRATIONS.—Concentrations are allowed to weather for from three months to a year, salt sometimes being added to assist the decomposition when it is the custom to work them in pans, etc.

PERCENTAGE RECOVERED FROM CONCENTRATIONS.—The Plattner chloridation process and its modifications save 90 per cent and upward of the gold contained in sulphurets, but the percentage obtained by the other methods is much less. It depends on the character of concentration, length of exposure to weathering, and the process by which the sulphurets are worked. The yield by other methods of chloridation often falls below 50 per cent, though usually it is higher.

Blanket sluices are of little use in silver mills except where the ore, although mainly free, contains rebellious sulphurets, as is the case on the Comstock and at some places in Idaho. At the California mill, about 10 per cent of concentrations are obtained per day. These are allowed to weather from one to six months, salt being added, and are worked in pans.

TREATMENT OF TAILINGS FROM SILVER ORES.—With that class of silver ores that is treated raw, it is rarely possible to extract such a per-

centage as to render the tailings worthless, and therefore these are commonly saved and allowed to weather, salt sometimes being added to assist the decomposition. As a rule, however, there is enough salt remaining in the tailings after working the ore to produce in the course of a year or two the required effect. It must be remembered that, no matter how fine a particle of tailings may be, there can still be a particle of silver mineral in the center of it so completely enveloped by earthy material that chlorine can not act upon it and quicksilver can not touch it. When tailings are treated, only that portion of silver is amalgamated that is exposed to contact with the quicksilver. As the outsides of these tailings particles have already been once subjected to the influence of chlorides and quicksilver, the amount of silver that can be recovered by a second amalgamation, of course taking it for granted that the ore has been properly treated in the first instance, except where long-continued grinding is practiced or where the character of the gangue has been changed by weathering, is exceedingly small. The percentage extracted from the tailings does not often exceed 50 per cent of the assay value, and generally falls far below this point. With the tailings from roasted ore, which are of lower grade than those from raw working, it is still more difficult to obtain the silver.

SLIMES.—Slimes sometimes assay more than the ore itself, sometimes less. The percentage of slimes escaping from wet-crushing mills varies from 1 to 15 per cent, according to the character of the ore. Ores containing much iron oxide generally produce the most slime. The slimes are usually first caught in large tanks, and then in shallow ponds. Eventually very little escapes if proper settling room is provided.

SALIVATION.—Only a few cases of sickness through salivation have been reported. The bursting or imperfect luting of retorts, and the cleaning up of pans while still hot, are frequent causes.

SAMPLES OF ORE.—Samples of ore are sometimes taken from each carload at the mine. This is the case at the California, where a handful is taken from each car. When the ore of a mine is treated by a custom mill, ore samples are often taken by the mine-owners as a check on the working of the mill.

BATTERY SAMPLES.—Battery samples are always taken at the mill, and in wet-crushing generally in the following manner: Every half-hour or hour, a rectangular iron box or dipper is passed along under the lips of the mortar where the pulp falls into the sluices, and a portion of the slimes and sand is taken, care being observed to prevent concentration by the overflowing of the box. This sample is put in a bucket with others, and at the end of twenty-four hours the clear water is poured off and the collective samples for the day are dried and prepared for assay.

In dry-crushing mills, it is usual to take the sample by passing a box along the lower part of the screen every hour or so. Sometimes the sample is taken from the conveyor or from the pulp in the bins.

TAILINGS SAMPLES.—Tailings samples are taken from one or all of the discharge-plugs of the settler, or are dipped from the top before each plug is drawn. A very good way is to dip a small gas-pipe into the settler close to the top, one end of the pipe being closed with the finger, and withdraw a portion of the pulp.

BULLION SAMPLES —Silver bullion is sampled by taking a dip from the melted mass after stirring, or a little is poured into water while the crucible is still nearly full, and a little more when it is nearly empty. Either method is good. Gold bullion is sampled by chipping two diagonally opposite corners of the bar after it is cast.

ORE ASSAYS.—Ore assays are generally made in crucibles, though with very base ores scorifiers are sometimes used. They are seldom corrected for loss in assaying.

THE MINING OPERATIONS OF THE ROMANS.

Before the antiquarian section of the Royal Archæological Institute, which has just been holding its annual meeting at Newcastle-on-Tyne, the Rev. Joseph Hirst, of Wadhurst, read a paper on this subject. He said: As the Romans gradually extended their conquest over the world, they became more and more aware of the immense increase to their wealth that might be derived from skillfully conducted mining operations. Indeed, the desire to obtain possession of such countries as yielded most abundantly the various metals that were required for objects of use or luxury seemed to have led them to push their conquests in certain specified directions rather than in others. Spain, a country of gold and silver mines, had been called the Indies of the old world. As then Tyre and Carthage had sent Phœnician colonists to establish their factories all along the coast of Africa as far as the Atlantic, who having crossed over into Europe, settled along the far-stretching shores of Spain, and, according to an ancient tradition, pushed their trading outposts as far as the British Isles; so the Romans poured into Spain and reaped there the benefit of the discoveries and of the labors of those who had been before them in the field. Tunnelings of a Phœnician origin might still be seen in that country, and there the Romans found mines of gold, silver, copper, tin, mercury, iron, sulphur, and salt. During the republic, the state did not occupy itself much with the management of mines, upon which it looked with some disfavor, but left them chiefly to the care of private enterprise. Very little was known about the principles that at that time guided the policy of the Romans in this matter. To one who read the thirty-third book of the Natural History of Pliny, it might appear that indifference to wealth and compassion for their fellow-creatures were at the bottom of this disfavor shown by the Romans in their early history for the work of mines. Various proofs in support of this theory were collected by Barba in his *Métallurgie*. Certain it was, that after the conquest of foreign lands, it was altogether forbidden to work mines in Italy, the mother country. Yet it was remarkable that Pliny should consider Italy the richest country in the world for mineral wealth. However much frugality, sobriety, simplicity of manners, and disregard for luxury might have been virtues practiced by the Romans in the early days of the republic, they but too often yielded in later days to sentiments of a different order. It had been submitted that the restriction limiting the number of men to be employed in the mines of Vercellæ to five thousand, so that no more should be employed in the works at one time by the public contractors, was to prevent the latter from exhausting the mines under the terms and by the force of one agreement. Similar restrictions might have been suggested for similar reasons. Thus it was forbidden by a decree of the Theodosian code to export silver from the rich mines of Sardinia on to the mainland. In course of time, however, the greed of gold, so much inveighed against by the Roman moralists, became universal throughout the empire. Mines and public works of all sorts were seized upon, monopolized, and administered by the state through the agency of public farmers, called technically *publicani*. In the days of the republic, however, only the more important mineral products, whether in Italy or the provinces, were claimed as belonging to the state. Among the works at that time in the hands of the government were, said Marquardt, the gold mines near Vercellæ, in Northern Italy, employing, as already stated, 5000 hands; the silver mines near Nova Carthago, in Spain, where 10,000 men were employed, and where the daily output was reckoned at a value of 25,000 denarii; the gold and silver mines in Macedonia; and the tin and lead mines near Sisapon, in Bætica, the modern Almaden in Andalusia. The same fate fell to the lot of a great many other mines, which, when let out by the revenue officers to those who thus came to farm them, were deemed capable of yielding a goodly income. The greater portion, however, of the mines throughout the Roman dominion were still left in the hands of private speculators. In fact, the heavy rent paid by private works was more profitable to the state than the smaller and more precarious sums paid by the *publicani*. Livy made the express statement concerning the iron and copper mines in Macedonia, that they were to be left in the hands of the provincials: while of the gold and silver mines, he said that, on the formation of that country into a Roman province, they were altogether closed, though it was related that some ten years afterward they were reopened and let out in the ordinary way, through the *censores* to several *publicani*. Plutarch told them that there were in his time throughout Spain and elsewhere gold and silver mines still left in the hands of private individuals which had made those who possessed them as rich as Crœsus had become by his famous silver mines. However, the mines of all kinds, which in the time of the republic were left in the hands of private enterprise, were by the more powerful emperors seized, in part to swell the public revenue, and in part to replenish the imperial private purse. Thus, as time went on, almost all the rich and large mines fell into the hands of the head of the Roman state. Among the imperial possessions must, therefore, be numbered the gold mines in Dalmatia, the silver mines in Pannonia and in Dalmatia, the gold mines in Dacia, as well as the tin and lead, not to speak of the gold and silver mines, in Britain. To these might be added the iron mines in Noricum, in Pannonia, and in Gallia Lugdunensis, and the famous copper mines in Cyprus, and those of Bætica in Spain. The reverend gentlemen here gave a minute and detailed account of all that is known as to the manner in which smelting furnaces first came to be used and afterward developed. A curious side-light was, he said, thrown upon the whole subject of mining by the unraveling of the somewhat novel information to be gleaned from the ancient inscribed bronze tablets that were discovered in 1876 in a long since disused ancient Roman mine in Portugal. In conclusion, he said there were two distinct ways in which state mines were worked by the ancient Romans. Either they were let by the Roman revenue officers to the *publicani*, or they were kept in the possession of the state and were handed over to the *procurator*. In the first case, the *publicani* themselves undertook to pay the revenue a fixed sum for the mines they farmed, while they themselves exacted such taxes from the owners or workers of those mines as to leave themselves a margin of profit for their trouble. In the second case, the imperial procurators either worked the mines themselves at the risk and profit of their masters, or they let them out to companies or individuals, who paid them a certain rent fixed in proportion to the number of men employed in them. The *procurator*, if he worked the mine himself, had under him a slave, who acted as director of the work; a foreman, whose office it was to test and pass the work done; and an engineer, who had charge of the mechanical contrivances. If the *procurator* let the work of the mine out to others, it was either to a single contractor or to a company, who, before the law had the status of *publicani*, and were often given that name. The *publicani*, however, properly so-called, were mere tax-collectors; the former, or the contractors, were real administrators of the mines. In either case, however, that is, whether the *procurator* himself worked or whether he let out the mine, he had all the accounts of the commercial enterprise to keep in an office established for the purpose. In it the *procurator* had under him a clerk or register-keeper, a steward or disburser, a collector or caster of accounts, and a treasurer. Officers and soldiers were stationed to guard the mine, and to keep order among the workmen. For this purpose, either a tribune, a centurion, or a decurio was detached from his regular corps, and stationed in the mining district, either in a position of independence, or under the command of the *procurator*. The workmen were either common slaves, hired freemen, soldiers, or convicts and prisoners. During the age of persecution, Christians were sent in thousands to the copper mines of Palestine, and to the various mineral or stone mines of Cilicia, the Thebaid, and Cyprus; as, after the taking of Jerusalem, the captive Jews were in part condemned to work in the mines and quarries of Egypt. These poor prisoners were all, like ordinary criminals, on being condemned to the mines, first beaten with rods. While at work, their feet were kept in irons; they had to sleep on the bare ground, they were pinched in food, deprived of the use of the bath, and were almost naked. In the subterraneous mines each workman bore a little lamp, fixed to his forehead, to guide his footsteps and serve as a signal to others, while the air and stench of these ill-ventilated caverns was so great that the ill-treated laborers often swooned away. Pliny tells how in his day these poor creatures were kept hard at work day and night, many of them spending whole months underground without ever seeing the daylight; for the burdens they carried on their backs they handed over to others, so that the last of the file only came near the mouth of the pit. The lecturer concluded with an eloquent passage from one of the letters written by St. Cyprian, the great African bishop of the third century, in which many of these particulars were set forth. It was, he said, inscribed to Nemesianus, Felix, and other seven, his fellow-bishops, likewise to his fellow-presbyters and deacons, and the rest of the brethren in the mines

VERMILION—ITS MANUFACTURE IN CHINA.*

The Chinaman has no knowledge whatever of chemistry, and of the principles of natural philosophy and statics generally his notions are of the most rudimentary and primitive description. How, then, in the face of these obvious disadvantages have the Chinese contrived to place themselves in the front rank among nations in the matter of certain chemical manufactures, one of the most important of which is the subject of this article, Vermilion?

On entering the factory proper, scores of little stone mills, each being turned by one man, and other long rows of workmen weighing out and wrapping up the vermilion will be seen. The furnaces are then arrived at: these may be a score or more in number, and may be ten or twelve in each furnace-room, five or six on each side. After passing these, the stores of quicksilver, sulphur, alum, glue, new spare iron pans, serviceable crockery ware, and sieves and other utensils used in the factory are arrived at, and this completes the view of the works The iron pans in which the vermilion is sublimed are circular and semi-spherical in shape; all are of the same size and weight; they are cast upside down, and in the casting, a runner or lump of iron, two and three eighths inches in diameter by from six eighths to one inch in depth, is purposely left on every pan, in order to enable the workman the more readily to handle the pan when stirring up its contents. The size of the pans proved by actual measurement to be 29¼ inches in diameter, by eight and seven eighths inches deep, and the weight 40 catties, or say about 53 pounds. These pans are set in rows of 5 or 6 on each side of a small rectangular room, in size some 12 feet by 15 feet; the door of this room is of wood, and contains an aperture a few inches square, in order to enable the workman to watch the progress of his operation, from time to time, without the necessity of lowering the temperature of the apartment by opening the door. The pans are set in brick-work, each pan having beneath it a grate to hold the charcoal used as fuel. There is no communication between the grates or furnaces under each pan, and no chimney, the flames and products of combustion finding exit from the front of the grate, which is left wholly open at all stages of the operation.

The process of manufacture is as follows: Taking an iron pan, which is of four inches smaller diameter than those described, and also in all other respects proportionally less, except the runner, which is of the same size, a skilled workman proceeds to weigh out 17½ pounds of sulphur. This he places in the pan, and adds about half the contents of a bottle of quicksilver. The pan, with its contents, is then put upon a small earthen brazier or portable furnace, the fuel used in which is charcoal. When the sulphur is sufficiently melted, the workman, taking an iron spatula or stirrer, rapidly stirs up the quicksilver with the sulphur, and gradually adds the remaining contents of the bottle of quicksilver, stirring the two ingredients together meanwhile until the mercury has wholly disappeared, or "been killed," as the Chinese put it. When this takes place, the pan is removed from the fire, a small quantity of water is added, and rapidly stirred up with the contents of the pan, which have now assumed a dark blood-red appearance and semi-crystalline structure. This mass is then turned out of the pan into an iron mortar, and then broken up into a coarse powder. This forms a charge for one of the large pans previously described, and when sufficient material has been prepared to charge all the pans in one furnace chamber, the sublimation is proceeded with as follows: All the pans having received their quantum of crude vermilion, this is covered with a number of crockery or porcelain-ware plates of tough, strong manufacture, each about 8 inches in diameter; some of these plates, however, are broken up, and are in a more or less fragmentary condition. When these plates have been piled up into a dome-shaped heap of the same shape as the bottom of the upper pan, to which they should extend, the whole is covered with one of the smaller pans previously described. Now, it will be remembered that the smaller pan was of 4 inches less diameter than the larger one; there will consequently be a circular space of two inches all around between the circumference of each pan. Consequently the rim of the upper or covering pan will be about two inches lower than the rim of the lower pan; there will also be some four inches space horizontally between the rim of the large lower pan and that portion of the smaller pan which is at the same hight as the rim of the larger one. This space is carefully filled with a clay luting into which some holes, generally about four in number, are pierced, extending down to the rim of the smaller pan or cover; this is done in order to allow the heated air and other matters to escape. All the pans in one furnace chamber being thus charged and covered, the fires are lighted. The flames from the charcoal should occasionally play several feet above the mouths of the furnaces. The door of the chamber is kept closed, except when it is open for a moment in order to enable the workmen to replenish the fires, which must be kept up at a fierce heat for eighteen hours. During this process, a blue lambent flame is seen to play above each of the four holes that are pierced through the clay luting of the pans, so it is evident that a considerable quantity of either one or probably both the ingredients is wasted. After eighteen hours, the fires are allowed to go out and the contents of the pan cool down. When this is accomplished, the greater portion of the vermilion will be found adhering to the lower surface of the broken-up porcelain plates with which the crude product is covered. The vermilion is then carefully removed from the porcelain by means of chisels, and is now ready for the elutriating mills. Another portion of vermilion of not so good quality is found adhering to the upper iron pan and that obtained by washing the clay luting in a cradle, as diggers wash dirt for gold. This, together with the wipings and scrapings generally, is mixed up with alum and glue-water into cakes, and, after drying on a brick surface heated beneath by means of wood or charcoal, is powdered up on a mortar and re-sublimed when a sufficient quantity has accumulated.

The vermilion that was removed from the porcelain plates is of a blood-red color and crystalline structure. This is then powdered up in a mortar and removed to the levigating mills. These are the ordinary little horizontal stone mills used by Chinese and other natives of the East to grind rice and other grain into flour or pulp, as the case may be. Each stone is about 2½ feet in diameter. The lower stone is stationary, the upper is turned by a direct-acting piece of wood having a hole in it that works a wooden peg affixed to the upper stone, which is made to revolve by a backward and forward movement of the piece of wood or handle, some 3 or 4 feet long, previously mentioned. One man turns each mill. The upper stone has a small hole in it near its center, down which the workman from time to time pours a little spoonful of the powdered vermilion, which he washes down into the mill with water. As he turns the mill, the workman keeps continually ladling little spoonfuls of water down the aperture or hole in the upper stone. The ground and thus elutriated vermilion, as it escapes from between the stones, is washed down by the water into a vessel placed beneath to receive it. When work is suspended for the evening, the ground vermilion is carefully stirred up with a solution of glue and alum in water, in the proportion of about an ounce of each to the gallon. The glue has been made to mix with the water by previously heating it with a small quantity of water; the earthen pots in which this process is effected each hold about six gallons. The mixture is then left to settle. On the following morning, the mixture of glue and alum is poured off the vermilion, and the upper portion of the cake of vermilion at the bottom of the vessel—that is, the portion that remained longest suspended in the liquid—will be found to be in a much finer state of subdivision than the lower portion, which requires to be again elutriated as on the previous day. This separation of the more finely divided vermilion from that which was coarser, by suspension in a dense medium, is a really most ingenious process, for which we should give the Chinaman every credit. The process of grinding, elutriation, and separation of the coarsely ground from the fine vermilion, sometimes requires to be several times repeated, in order to fully bring out the color. As a final process, the damp cake of finely ground vermilion is stirred up with clean water, and allowed to settle down until the next morning, when the water is carefully poured off into large wooden vats to still further deposit a small quantity of vermilion still remaining in suspension, and the vermilion dried in the open air on the roof of the premises. When quite dried, the cakes of now full-colored pigment are carefully powdered and sifted by means of square muslin-bottomed sieves, contained in a covered box some 2 feet high by 2½ wide, in which the sieves, which slide on a frame-work inside the box, are jerked backward and forward by means of a handle on the outside of the box or case containing them.

The now fully prepared vermilion is removed to the packing-house, where may be seen rows of workmen, men and boys, seated before a series of tables. Between every two workmen is a third, with a small pair of scales, which he holds in his left hand; and as the workmen on either side place before him the little pieces of paper in which the vermilion is to be wrapped up, he weighs into each paper one tael (about an ounce and a third avoirdupois) weight of vermilion: the papers are two in number, the inner a black or prepared paper, and the outer a piece of ordinary white paper. After being wrapped up, the packets are placed in rows before another workman, who stamps them with a seal containing in Chinese characters the name and address of the manufactory in which the article has been made, and the quantity and quality of the vermilion contained in the packet.

The rapidity and deftness of the Chinese workmen at this employment is really surprising. The stamping, for instance, is effected at the average rate of sixty impressions a minute, and the wrapping up is carried on with proportionate rapidity. The mixture of alum, which is the ordinary aluminium potassium sulphate, with the vermilion, in one of its stages of manufacture as described above, is not added, as at first sight we thought it might be, merely to assist in clarifying or purifying the water by causing it to deposit its sentiment, but seems to have some peculiar effect upon the color, although what may be the *rationale* of the process, or how it acts we can not quite clearly see; the glue is added as described above, merely to favor separation of the finely elutriated vermilion by holding it longer in suspension than the coarser particles, which sink first, and may therefore be separated in their order of stratification. The actual composition of vermilion is one hundred parts of mercury to sixteen of sulphur, when both these ingredients are in a perfectly pure state; the excess of five and one third pounds of sulphur added by the Chinese is probably volatilized and lost in the process of sublimation, or, as the sulphur used is generally not quite pure, a part may go for foreign matter contained in the sulphur; the remainder being probably the *raison d'être* of the blue lambent flame seen playing over the apertures in the luting during the sublimation process. For a people having, like the Chinese, no acquaintance with even the first rudiments of chemistry, the proportion of ingredients taken—56¼ catties to 13 catties, or say 75 pounds to 17 and one third pounds—shows wonderfully accurate powers of observation and a knowledge of combining proportions only to be gained by much experience and a long extended series of careful observations highly creditable to the manufacturers. The entire process is one of the most ingenious and interesting to be seen in any part of the world.

T. I. B.

HONG KONG, March 29, 1884.

* From the *Chemical News*.

A NEW mine has recently been opened on the Davis farm, near Mineral Point, Ohio, on the Valley Railroad. David Barnheisel, of Cleveland, is the proprietor.

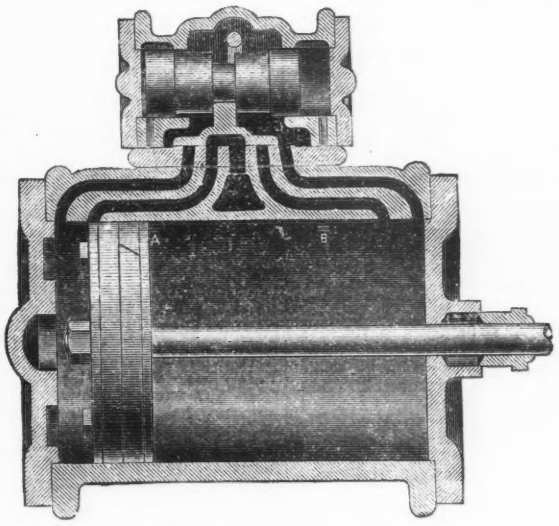
SAMUEL GIBBONS, a draftsman with the Brown Hoisting and Conveying Machine Company, has invented a lineograph, an instrument by which any line from a horizontal to a circle, or any angle or variation between the two, can be made with one motion. The instrument will undoubtedly prove of great convenience to all professional draftsmen.

THE Baltimore & Hartford Coal Company, of Buffalo, Guernsey County, Ohio, is opening a new mine near Hartford. It has a five-foot vein reached by a 100-foot shaft. Griffith & Wedge, of Zanesville, have the contract for furnishing the hoisting-plant complete; by the time this reaches the readers of the ENGINEERING AND MINING JOURNAL, the mine will probably be in operation.

MESSRS. BOLCKOW, VAUGHAN & CO.'s great steel-works at Eston, Middlesborough, have been idle for a fortnight, and there is no probability of their being started for some time. These works can produce about 5000 tons of rails a week. It is stated that if Bolckow, Vaughan & Co. had had the good fortune to secure the whole of the steel rail orders that have been given out this year, they would not have been sufficient to keep their gigantic works in full operation.

THE HALL DUPLEX STEAM-PUMP.

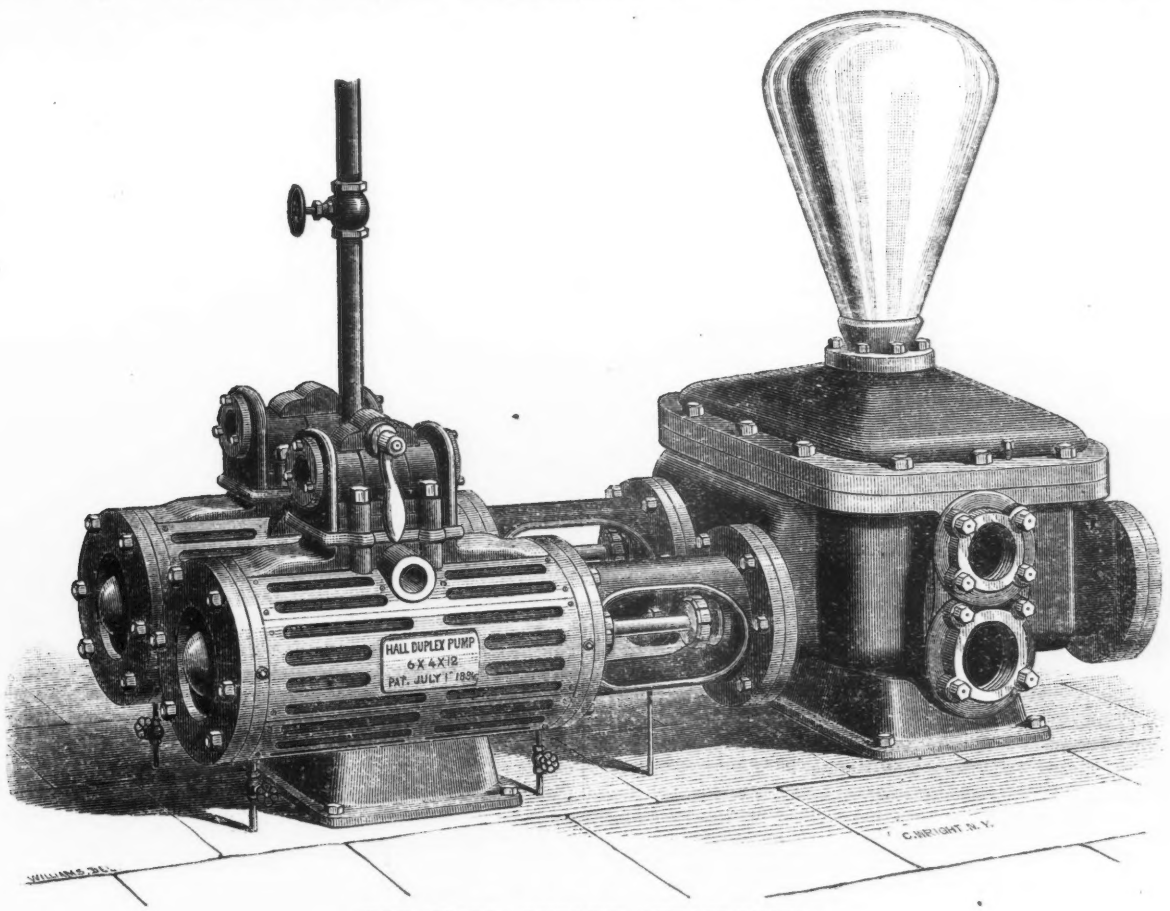
The Hall Duplex Steam-Pump Company, of this city and of Boston, has recently brought out a pump that has special features commending it to those who depend on their pumps for constant, steady work, without being harassed by frequent repairs. While our perspective view shows the general design of the pump, its operation will best be studied by reference to the sectional view of the steam-cylinder and chest. The engine of one division acts to operate the steam-valve of the other, and *vice versa*. In the above view, the valve, a plain flat *D* slide-valve, stands at the left of its stroke, admitting steam to the right of the main piston, moving it to the left. When the piston nearly reaches the end of its stroke and passes by the port *A* (at the top of the cylinder), a small portion of steam, which has been moving the main piston, passes through this port across to and shifts the valve of the other engine, which then makes its stroke, and in a like manner admits steam across to reverse the valve of the former. It will thus be seen that, by proper location of the ports in each cylinder, corresponding to *A* and *B*, each engine must in its turn make a full stroke before giving steam to reverse the valve of the other; the admission of steam, however, being timed so that each engine starts a little before the other stops, thus keeping up a continuous and uniform delivery of water. This entirely obviates the difficulty of short strokes and consequent waste of steam. The location of the ports *A* and *B*, near the end of the stroke of the pistons, causes each in its turn to pause (while the other is making its stroke) for a length of time sufficient to allow the seating of the pump-valves by gravity instead of by the action of the return currents.



The pistons cushion upon steam entrapped in the ends of the cylinders by the pistons passing beyond the exhaust-ports, the inlet-ports at the ends of the cylinder being closed by the main steam-valve. The cushion of the pistons is so effective that the whole load against which the pump is working may be suddenly thrown off while having on a full head of steam without any danger of the pistons striking the cylinder-heads, or in any way injuring the pump.

The water ends, either piston or plunger pattern, have valves that are plain flat disks of composition, or hard or soft rubber, working with a low lift upon a central stem.

It is claimed for this pump that its extreme simplicity, and the reduction of parts to a minimum, render derangement unlikely; that there is no possibility of dead-centers, or inability to start from any point in the stroke; that it runs without jar or shock, and occupies but little space; and that it is positive and certain of action.



THE HALL DUPLEX STEAM-PUMP.

LEAD MINING IN SPAIN.

In Southern Spain, the most important districts producing argentiferous lead are Carthagena and Sierra Almagrera. In both districts, argentiferous lead ores are mined that are smelted with the lead ores of Mazaron, Cabo de Gata, and Linares. In the Carthagena District, there are more than a hundred small smelting-works clustering about Union and Alumbre. In the best-designed works, the ores are roasted in Freiberg fortschaufelungsöfen, and are then smelted in small three-tuyere blast-furnaces with brown iron ore obtained from the Sierra de Carthagena. Many works use roasted matte as a flux. Often, however, the matte is not worked at all. In most of the works, blast is furnished by fans or blowers, the furnaces that formerly were worked by natural draught having become a rarity. In some of the works, the ores are smelted without being roasted, and then large quantities of matte are obtained, which are thrown over the dump, except that amount that is roasted and added as a flux.

The Carthagena lead carries from 0·9 to 1·2 per cent of silver, the average monthly output being from 2000 to 2500 tons. The quarter part of this base bullion is sent to England to be desilverized, a part of it is desilverized with zinc at the Figueroa works at Carthagena, while some of it is sold at Marseilles.

The works along the foot-hills of the Sierra Almagrera work in a manner similar to that practiced at Carthagena. The ores of the Sierra Almagrera District are a close mixture of blende, iron pyrites, and galena, with native silver, antimonial silver, and chloride. The average grade of these ores is 0·16 per cent of silver and from 20 to 22 per cent of lead. These ores are mixed with galena from Mazaron, Cabo de Gata, and Linares, and, after roasting in heaps or in Freiberg reverberatories, are smelted in shaft-furnaces with brown iron ore as a flux. The furnaces do not differ from those of the Carthagena District, Pilz furnaces being introduced only at the Aguilas and La Garrucha works. One of the Spanish furnaces has a daily output of from 1½ to 2 tons of lead, while the Pilz furnaces make seven tons.

In the Herrerias de Cuevas, at the foot of the Sierra Almagrera, a brown iron ore is mined that is the product of the decomposition of argentiferous pyrites. It contains as much as 0·75 per cent of silver. This iron ore, mixed with pyrites, is smelted in a blast-furnace for matte in which the silver in the ore concentrates. This matte is roasted in heaps or stalls, and is then used as a flux in smelting raw or roasted silver ores.

The base bullion is partly sent to England and partly to France, and some of it is desilverized at La Garrucha works, at the foot of the

Sierra Almagrera, where the method employed is the treatment with zinc, and the working of the rich zinc scum by the Flach method. There are other small desilverizing works at Villaricos and Escombrera. At Villaricos, experiments were made with the Rosswag desilverizing process, which was, however, subsequently abandoned. At Escombrera, the Pattinson process has been in use, but has been given up.

The lead ores of the Linares District produce fully two thirds of Spain's total output. They are not rich in silver, carrying only 0·018 per cent of silver. The greater part of the ores is shipped to other points. There are two smelting-works near Linares, which also desilverize the lead. One of them, La Fortuna, uses the Pattinson process, while the other, La Cruz, employs the Rozan modification of it.

FURNACE MILL, AND FACTORY.

J. Painter & Sons, of Pittsburg, have started up 23 of their 68 puddling-furnaces after an idleness of four weeks. The gas-well of this firm is down 1145 feet.

The Crane Iron Company, of Catasauqua, Pa., is preparing for the manufacture of Bessemer pig-iron. If the experiment proves successful, the company will be able to secure orders to keep at least one furnace in blast for a year or more.

The Phœnix Bridge Company, of Phœnixville, Pa., has entered into a contract for the construction of an elevated railroad in Brooklyn, N. Y.

The Benwood Nail-Works, situated four miles south of Wheeling, West Va., closed down for an indefinite period September 4th. This action was decided on by the manufacturers at a recent meeting, being unable to compete in the market with Western mills. This throws over six hundred men out of employment.

A dispatch received at Washington, D. C., from Director-General Burke, of the New Orleans Exhibition, states that Machinery Hall has been extended 350 feet, giving it a total length of 1728 feet, and is likely to be still further extended. Two and a half miles of shafting have been received, and more is to come. The capacity of boilers and engines approaches 6000 horse-power. Twenty elevators with safety appliances have been ordered.

D. W. Jennings has shipped to Messrs. D. Manroy & Co., Antwerp, Holland, a 12 by 24-inch Buchanan magnetic ore separator.

The Iron Bay Manufacturing Company, of Marquette, Mich., is exhibiting an external friction hoist at Butte, Montana.

Messrs. Hodge & Co., of Detroit, have secured the contract for furnishing the Penn Iron Mining Company with a new pumping plant that is to cost $25,000.

The Florence furnace, lately sold at sheriff's sale, was purchased by representatives of Cherrie & Co., the price being $26,664.

Under date of August 4th, Messrs. Fraser & Chalmers, of Chicago, have issued a circular reciting the following: "The suit of David R. Fraser, Thomas Chalmers, and H. H. Scoville, Jr., *vs.* the Gates & Scoville Iron-Works, now known as the Gates Iron-Works, which has been pending for some time in the Circuit Court of the United States for the Northern District of Illinois, has lately been decided in favor of the complainants (Fraser, Chalmers & Scoville.) This suit was brought for the infringement of letters patent of the United States granted to J. W. Rutter, being Reissue No. 3633, dated September 7th, 1869. The Court, Judge Blodgett sitting, held the Rutter patent to be valid, and found that the said defendant, the Gates & Scoville Iron-Works (now the Gates Iron-Works, P. W. Gates, President), had infringed the first claim thereof. This decision was obtained after a full hearing. The crushers which we manufacture, known as the Comet, contain the invention secured by the said Rutter patent, which covers an important feature. The crushers manufactured and sold by the Gates & Scoville Iron-Works advertised as 'the Greatest Crusher on Earth,' contain the same valuable feature, and, as decided by the court, are an infringement of the said Rutter patent, which we control."

Articles of incorporation were filed at San Francisco, Cal., by the Excelsior Dynamite Company, which purposes manufacturing powerful explosives by a new process. The capital stock is $1,500,000, in 30,000 shares of $50 each.

The improvements at the steel-works at Cumberland, Md., necessary for successful operation by the new company, are in progress. The gas furnace is enlarging, and will be completed in about two weeks.

Latest returns received by the Secretary of the Western Pig-Iron Association do not indicate that the movement to secure united action in the restriction of production by the banking of furnaces on the line proposed has been accepted by a sufficient number of furnaces to cover the terms of agreement.

The Girard White Lead and Zinc-Works at Philadelphia, Pa., which were visited by flames several months ago, were again destroyed by fire September 6th. The loss can not be given, but it is entirely covered by insurance.

The Quinnimont, West Va., furnace is standing idle, with no prospects of starting up. The miners and furnace-men have nearly all left for other fields.

LABOR AND WAGES.

The Crane Iron Company of Catasauqua, Pa., has made a reduction of 10 per cent in the wages of its employés.

The employés of the Oxford Iron Company, at Oxford, New Jersey, have been notified of a reduction of ten per cent in their wages, to take effect on the 15th inst.

The employés of Corning's Mills at Troy, N. Y., have agreed to accept a ten per cent reduction in wages, and work has been resumed in the various furnaces and steel mills.

The molders in the employ of C. A Blessing, iron founder, at Philadelphia, Pa., have given notice that they will organize a strike soon, in consequence of a 10 per cent reduction in wages.

Cooper & Hewitt, who own the Ringwood mines at Greenwood Lake, N. Y., have transported their men to Jersey City, and set them at work turning out Belgium pavement at the quarries.

The announcement that officials of the Amalgamated Association of Miners and Laborers have ordered the members of the organization employed in the bituminous districts of Clearfield County, Pa., out on a strike, has created excitement in trade circles. This movement will place between fifteen and twenty thousand operatives in idleness. John Britt, District President of the Amalgamated Association of Miners and Laborers, says that the strike will not only be inaugurated for wages, but a strong move will be made to abate or entirely abolish the company store system. It is probable that the strike will become general and include all the collieries working in Western, Central, and Northwestern Pennsylvania.

The stove-molders' strike at Cincinnati, Ohio, is growing more serious. The Chamberlain foundry has now stopped and joined the other manufacturers. A few men who are at work at the other foundries are virtually imprisoned, it being dangerous for them to appear on the streets.

The National Association of Stationary Engineers, at their meeting in Baltimore, Md., selected St. Louis as the place of the next meeting, to be held the first Tuesday in September, 1885.

The miners at the Hickox, Springfield, and Wilmington coal companies' mines, Illinois, have gone out on strike for an increase from two and a half to three cents a bushel. The neighboring mines are now paying three cents.

The coal miners of the Monongahela River, through delegates, assembled in convention at Pittsburg, September 8th, and resolved to continue the strike for 3½ cents a bushel for mining that was inaugurated four months ago, and which has been so bitterly contested.

A dispatch from the Chicago *Inter*-Ocean dated Columbus, Ohio, September 7th, says that the events of the past week in the Hocking Valley, and the present status of affairs, indicate that a crisis is near at hand, in which either the operators or miners will go to the wall. The suspense that has attended the contest during the past ten weeks will without doubt come to an end during the present week, and at this writing all signs point to a defeat of the strikers. The decision arrived at by the operators, in abandoning their mines and property at New Straitsville, is without doubt the most crushing blow that could have been given, because at this place the majority of the old miners own their own homes, and aside from mining the place has no importance whatever. It was near New Straitsville that the coal-hopper was burned a week ago, and the company has decided to abandon all the mines on the Straitsville branch of its road, and concentrate all mining operations within a smaller circle near Nelsonville, on the main line of railroad, thus virtually shutting New Straitsville out until such time as the managers may see fit to rebuild and resume operations. A large force of new miners is arriving on the ground, and the work of turning the strikers and their families out of the company's property is progressing thus far without opposition. It is hardly probable all the strikers would now be taken back, should they accept the terms of the operators. An impression has gained currency that the new miners are Italians; but this is not the case, as a few were tried and would not meet the requirements of the operators. In addition to the disturbed condition of affairs in the Hocking Valley, the gravity of the situation is aggravated by the closing of the mines of the Ohio Central road on Tuesday next, for an indefinite period, which will leave none but the Rend mines and those of the Sunday Creek Coal Company at work in the Sunday Creek Valley, and it is not certain that these will be operated after the 9th inst. Both companies, however, have notified their miners that they may continue at the 70-cent rate if they desire. The closing down of the Ohio Central mines will also be damaging to the Hocking Valley strikers, as the large contributions from that source will now cease. Already the coal operators in the Hocking Valley have expended $150,000 in cash to break the strike, while the loss in trade far exceeds that amount. The striking miners are destitute, and the governor has already been asked that tents for the destitute families be provided by the State. Governor Hoadly was much inclined to withdraw the troops yesterday, but this was strongly objected to by the assistant adjutant-general, who has charge of the forces in the valley, who regarded such a move at the present time as dangerous in the extreme. As a rule, the miners are well-behaved, but there are a number of reckless men among the strikers, who are only awaiting the withdrawal of the troops to begin the work of murder and destruction.

The State Miners' Association will hold a convention in Columbus, on Tuesday next, which, without doubt, will be the most important gathering of that body that ever assembled.

The Coal Miners' Protective Association of Colorado was recently organized at Denver for promoting the following purposes: First. To secure for the coal miners a just remuneration for their labor. Second. To settle trade disputes by arbitration or conciliatory means when possible. Third. To secure legislation to carry out and promote the above objects. A committee appointed by the convention held a lengthy interview with Mr. Cameron, Superintendent of the Colorado Coal and Iron Company, with the view to the amicable settlement of the existing strike of the miners employed by that company against an unjust reduction of ten per cent. Nothing was accomplished by the interview. The company seems determined to enforce the reduction. The representatives from other parts of the State propose to assist the Coal Creek miners in the strike.

The molders in the employ of the Manhattan Hardware Works, Reading, Pa., left their work September 11th, owing to a reduction in their wages.

Reports from Cincinnati, Ohio, state that more than twenty thousand workingmen are idle in that city.

The Edgar Thomson Steel Company at Pittsburg, Pa., on September 11th, notified its employés that, unless they accepted a reduction of wages, a suspension of operations would be necessary. Andrew Carnegie is the head of the company, which employs nearly five thousand men. The probabilities are, that the reduction will be accepted, as the number of idle men in the vicinity is greater now than at any other time during the past ten years.

RAILROAD NEWS.

An application was made to Attorney-General O'Brien at Albany, N. Y., September 9th, to dissolve the Rochester & Pittsburg Railroad Company, on the ground that the road, as at present constituted, being a consolidation of five or six roads, two of which are in Pennsylvania and the rest in this State, has issued $10,000,000 in stock, being $3,000,000 in excess of the consolidated capital stocks of the roads, which is illegal. For this unlawful issue of stock, the attorney-general is asked to dissolve the corporation. Charles E. Miller appeared for the application, and Wheeler H. Peckham opposed. The attorney-general took the papers and reserved his decision.

The appraisers of the Philadelphia & Reading Railroad properties have practically agreed that severe retrenchment can be effected by disposing of many collieries and coal tracts that have proved unprofitable. It is also stated that the large iron-works of the company at Reading will be disposed of to a syndicate that will convert them into Bessemer works. A number of furnaces along the line of the road will be disposed of also under this plan.

The Lake Shore & Western Railroad Company will begin its new ore-docks at Duluth, Minn., this fall, and push the work forward to a rapid completion, by June next, it is thought. The cost is estimated at $300,000.

COAL TRADE NOTES.

ARIZONA.

Hon. M. Brannon, special commissioner sent to examine and report to Congress the extent and quality of the Deer Creek coal-fields, has finished the examination and speaks favorably of the property. He found the strata well defined, and considers the quality of the coal good, but different from any that he had hitherto seen, being neither bituminous, semi-bituminous, nor anthracite, but combining properties found in all three. The veins are in a purely coal formation.

ILLINOIS.

The State Board appointed to examine applicants for State coal mine inspectors has finished its work. The following persons were successful, and will be recommended to the governor for appointment: Robert Winning, Carlinville; Alexander Ronald, Streator; Walton Rutledge, Alton; Thomas Hudson, Galva; John Rollo, Streator. All but the latter of the above-named were inspectors last year.

INDIANA.

The mines of the Brazil Block Coal Company and of the Jackson Coal and Mining Company are running every day, the companies having settled on yearly contracts. The contract made by the Brazil Block Coal Company is as follows: Eighty cents for the month of September, 85 cents for October and November; and if the wholesale selling price of coal should advance to above $1.60 per ton, the miners shall have 40 per cent, and if it comes below $1.60, then the miners to be reduced 40 per cent until the wholesale price comes below $1.35; and then the miners are never to be brought below 65 cents a ton for mining. The Jackson Coal and Mining Company's contract is as follows: Ninety cents for from 2 feet 6 inches to 3 feet; 85 cents for from 3 feet to 3 feet 5 inches; 80 cents for from 3 feet 5 inches to 4 feet; and all coal above 4 feet, 75 cents. Of course,

these two contracts were not satisfactory to all, but the miners thought it best to settle until coal trades revive again. The Watson & Crawford's mines have not settled, but it is thought they will begin to work soon.

MARYLAND.

The contract for furnishing coal to the State department at Annapolis has been awarded to Mr. Joseph S. M. Basil, he being the lowest bidder.

MONTANA.

A good deal of work is doing at the Sand Coulee coal mines, in developing the mines. In places where the vein has been cut through, it was found to be about seventeen feet thick. Sun River now gets nearly all its fuel supply from these mines.

The Northern Pacific Coal Company has shut down its mines at Lignite. The Northern Pacific is now getting its coal at Timberline, near the mountains. The shutting down of the Lignite mine throws fifty men out of employment. They were making about $4 a day.

OHIO.

Receiver William Ranney, of the Ohio Central Coal Company, closed the mines of that company September 10th, owing to the unsettled condition of trade and the difficulty of securing contracts for coal at the present rate of running, except at serious loss. It is stated that the mines will not be opened until the mining rate has been definitely established. The Ohio Central Company's mines include all in the valley except those operated by the Sunday Creek Coal Company and W. P. Rend. The Columbus & Hocking Coal and Iron Company has concluded to abandon New Straitsville as a mining point, and has begun invoicing all movable property preparatory to taking it to some other place in the valley.

The Jefferson Rolling-Mill Company, Steubenville, is preparing to start up its coal shafts.

PENNSYLVANIA.

ANTHRACITE.

The Philadelphia & Reading Coal and Iron Company has decided to abandon the old slope at Girard colliery, which closed in recently, and will start at once to sink a new one east of the present hoisting slope, for the purpose of lowering miners and lumber. It intends putting a new pumping-engine and pumps in also, owing to the large increase of water which it has to contend with from the new veins that have been lately opened there.

The Derringer colliery, near Hazleton, has been destroyed by fire. The breaker was about the largest in the Pennsylvania coal region, and was built a year ago at a cost of $150,000.

A breaker at the Florence colliery, at Pleasant Valley, about nine miles from Pittston, was destroyed by fire September 7th, causing a loss of about $40,000. The fire is said to be the result of carelessness.

A cave-in occurred at the Enterprise colliery September 5th, over property worked out, and which is not used except as a passage-way to the workings.

The breaker at the Pine Brook colliery of the Lackawanna Iron and Steel Company was destroyed by fire September 11th. The breaker had a capacity for producing 700 tons of coal daily, and employed about 200 men and boys. It was used principally to supply the works of the Lackawanna Iron and Steel Company with coal, and will be rebuilt without delay. The loss is estimated at $50,000, and the property was insured for $25,000. The origin of the fire is unknown.

The Enterprise mine, which recently caved in, has been closed in consequence of the dangerous condition of the surface, another fall of the earth being expected almost any moment. The gas in the mine is also very foul. Three hundred and fifty men are idle in consequence of the stoppage of the mine, which is a great loss to the community. It will be impossible to resume work for months to come, and probably not for a year, if the water from an adjoining colliery should make its way into the now deserted mine.

BITUMINOUS.

The Barclay Coal Company reports $6854 as rent of railroad and royalty on coal for the month of August.

COKE.

While the past fortnight has put a little better face upon the coke trade of the Connellsville region, says the *Courier*, the outlook is still gloomy. At present, of the 9820 coke-ovens in the region, 3951 are idle, or nearly 40 per cent. Of these, 3096 are the 45 per cent shut down of the pool; 64 are independent ovens; 422 furnace-ovens; and 369 are ovens that have been idle for the past year. The average daily shipments have materially increased, and now foot up about 620 cars. This increase of shipments is kept up by heavy consignments to Chicago. The mammoth iron and steel-works at Joliet have fired up again. They are taking more coke than they actually need, with the view of stocking up. When this is accomplished, trade here will slacken up somewhat. Labor is plenty at $1.25 a day, and the region is full of idle men seeking employment. The price of coke remains steadfast at $1.20 for foundry coke and $1.15 for furnace in large orders.

NATURAL GAS.

The management of the Cambria Iron Company, Johnstown, contemplates sinking wells in various parts of the company's property with the view to securing natural gas. A derrick has been erected opposite the Pennsylvania & Reading Railroad station, where the first well will be drilled.

WEST VIRGINIA.

The annual report of State Mine Inspector Oscar A. Veazey for 1883 is about ready for transmission. In the Kanawha District, he inspected 63 mines, which employ 2962 miners, 100 track-layers, 90 door-tenders, 329 drivers, and 691 outside hands, making a total of 4162 men employed. In addition to this force, 407 horses and mules were employed. There were also inspected in this district 543 coke-ovens. In the northern district of this State, 67 mines were inspected, employing 1476 miners, 84 track-layers, 13 door-tenders, 289 drivers, and 270 outside men, making a total of 2232; horses and mules employed, 340; coke-ovens, 259. The output in the State for 1883 was 2,805,565 tons of 2240 pounds. Of this total, 1,616,780 were from the Kanawha mines, and 1,188,785 from the other district. The coke made was 170,437 tons, of which the Kanawha ovens turned out 139,133, and the northern district ovens 2303.

GENERAL MINING NEWS.

ARIZONA.

GILA COUNTY.

The ten-stamp mill at Pioneer is removing by Mr. Hellings to the Vekol, and will soon be running. Mr. Hellings erects the mill for one fourth of the proceeds of the dump, on which there is said to be at this time fully $400,000 worth of ore. The high-grade ore from the Vekol is shipped to Kansas City for reduction.

OLD DOMINION.—Dr. Alexander Trippel, who has had charge of the metallurgical department of the Old Dominion Copper Company's works for a year past, has assumed the entire direction of the company's business in Globe, where the mining and reduction of ores are carried on.

PIMA COUNTY.

GUNSIGHT.—B. F. Bivins and others have organized a new company in St. Louis to operate this mine. The present defective machinery will be torn down and a new and substantial 20-stamp mill at once erected.

QUIJOTOA DISTRICT.

The Little Giant, Pima, and Arlie claims are now in course of incorporation. They are all in the hands of experienced miners, whose object is to work their properties for all they are worth. At the rate Quijotoa properties are now disposed of, it is safe to predict that in the course of six months 20 new incorporations will have been made, all in course of development.

EDINBURGH.—This company has been organized with a capital stock of $10,000,000. It is intended to start development at once. The Edinburgh is said to be a promising property, lying three miles in a northerly direction from the Bonanza group, this district, showing a solid ledge of ore composed of sulphides, gray carbonates, and horn-silver

CALIFORNIA.

MONO COUNTY—BODIE DISTRICT.

Reports for the week ended September 1st:

BODIE CONSOLIDATED.—At the mill, 190 tons of tailings were worked, the average assay value being $7 a ton. There is no change to report in the mine. All in and about the mine is working well. Thirty-seven men are employed.

BULWER CONSOLIDATED.—The vein is 18 inches wide.

CONSOLIDATED PACIFIC.—Since last report, the drift on Pacific ledge No. 1 has reached a distance of 42 feet from the chute. The rock is still hard. The ledge keeps an average width of 16 inches and yielding some good milling ore. Pacific ledge No. 2 has been advanced 5 feet. A small vein has been cut coming in from the west, which gives a fair prospect in the horn.

STANDARD CONSOLIDATED.—Extracted and shipped to the mill 552 tons of ore and 590 tons of tailings. Received from the ore 630 ounces of crude bullion and from the tailings 435 ounces. Shipped to the company this day, $16,004.92, of which $11,209.28 is from two weeks' run on ore, and $4795.34 from two weeks' run on tailings.

PATTERSON DISTRICT.

KENTUCK.—The mill has been generally repaired. There is a large quantity of ore on hand, which will be worked as soon as the pump now on the road arrives. Work is doing on both the Star and the Great Western mine, and some very fine ore is now in sight in the late developments.

COLORADO.

NORTH FORK CONSOLIDATED.—The mining property of this mining and tunnel company, situated on the North Fork of the South Arkansas River, was put up at auction at Philadelphia, September 9th, and sold for $5000.

CHAFFEE COUNTY.

TWIN LAKES.—This hydraulic gold mining company employs between forty and fifty men in washing out the precious metals and improving the property.

YANKEE BLADE.—The mine is pumping out, and shipments will soon be made. If the ore-bodies are such as to warrant it, a mill will be erected for treating the mineral.

CLEAR CREEK COUNTY.

The Denver *Tribune-Republican* states that there is a movement on foot in the vicinity of Georgetown, to cut miners' wages from $3 to $2.50 a day. The miners are greatly excited. All of the principal mines of the county are worked by the contract system and lease, and day men are exceptions to the rule, so that the attempt will likely fail.

DOLORES COUNTY.

Mr. Linwood O. Towne, of Rico, has sent us the following notes:

GRAND VIEW.—The mines are worked by the usual force of men, ore being taken from the Grand View and the Phœnix. Mr. N. R. Wilson, late of Leadville, has just assumed position as metallurgist at the smelter, where the furnace will soon be in operation.

RICO PASADENA SMELTING COMPANY.—Work on the new smelter, which introduces a new element in Colorado ore reduction, has been pushed to completion, and fire in the furnace was started September 7th. About two weeks will be taken in thoroughly drying and heating the furnace, connecting flues, chambers, etc., when the first charge will be put in. The management is most sanguine of the success of the process, which is said to have been thoroughly and successfully treated at the Cheltenham Works, near St. Louis. The work of putting up the furnace has been attended to by the patentee, and in general consists of improvements on the reverberatory furnace. A blast will be introduced, and the waste heat conducted through an elaborate system of flues, to be utilized in cupellation, roasting, heating boilers, etc. Results will be anxiously watched, not only by the mining men of Rico, but all Colorado, especially in the mountain towns, where the item of freight to Denver and Pueblo smelters is an important one. It is proposed to smelt at $15 or $20 a ton, or even cheaper when the capacity of the smelter is enlarged. The rates previously charged here have been uniformly higher, thus wholly preventing the development of many mines which have an abundance of low-grade ore. The management of the company is wholly in St. Louis hands, Mr. B. V. B. Dixon having direct charge of smelter. Quantities of ore have been furnished the new concern, and the sampling machinery, which has been put in operation the past fortnight, is kept steadily at work.

RICO REDUCTION COMPANY.—The new machinery for these works has arrived and is rapidly getting into place.

GILPIN COUNTY.

CALIFORNIA.—The company has timbered up the lower portion of the main shaft of this mine, and is now raising sufficient mill-dirt to keep its 75-stamp mill in operation. The present depth of the main shaft is 1620 feet. Sinking is continued. The vein matter remains the same as has been sunk through for the last 100 feet.

GUNNISON COUNTY.

The committee named by Captain Bean, President of the Chamber of Commerce at Gunnison, to secure subscriptions to assure the coming of the Mingo smelter to that city, has its work almost completed. The amount to be raised was $10,000 in cash and $15,000 in real estate, the same only to be delivered when the smelter, with at least a daily capacity of 80 tons, was completed and successfully treating Gunnison ores. The Mingo Company has been handling Gunnison ores for two years.

BLACK QUEEN.—It is reported that this mine, on Sheep Mountain, has been sold for $100,000.

HINSDALE COUNTY.

CROOKE MINING AND SMELTING COMPANY.—Lake City exchanges contain the information that this company is preparing for shipment the 4000 tons of concentrates stored near the works, from which it is inferred that contracts have been let by the Pueblo Smelting and Refining Company for hauling the same to the railroad, although no definite information upon the subject has been received. No. 2 shaft of the Ulé is going down steadily; the stopes between the seventh and eighth levels continue to yield high-grade mineral. The concentrator keeps up its steady run, and puts out about eleven tons a day. The gray copper ores being sorted and kept up separate from the galena ores and then mixed with the concentrates, brings the whole up to a very high state.

LAKE COUNTY.

The Leadville *Herald* says:

ADAMS.—During the past month, the mine produced and shipped from development-work 1500 tons of ore, averaging above smelting charges about $22 a ton. The net earnings of the mine have been proportionately large.

ARGENT.—This property was sold at auction at Philadelphia, September 10th. It was bought in by one of the bondholders for $275.

DENVER CITY.—The water has all been taken from this mine and active work begun.

LITTLE PITTSBURG.—During August, there were realized from the sales of ore about $11,000. The expenses of the mine for the same time, including repairs and permanent improvements, aggregated $7000, leaving a net profit of $4000. The cash fund of the company amounts to about $55,000. There are employed by the company sixty men, and the holders of leases on portions of the property are working a total of eighty-five men. Out of the ore-shipments of last month, over one half was the product of company work, the leasers producing mostly iron ore. Some of the mineral shipped by the company consisted of very fine galena ore, encountered in the iron in small pockets and seams, and netted $300 per ton.

SILVER CORD.—Mr. Spaulding, who is working a portion of the Silver Cord under lease, it is stated, has paid the company in royalty over $2500 in the past few months. A force of six men is employed in doing a limited amount of exploration-work, replacing broken timbers, and taking out enough ore to defray the monthly expenses of keeping the property in working shape.

WOLFE TONE & AGASSIZ.—Mr. H. H. Stotesbury, owner of these mines, on Carbonate Hill, has completed arrangements for resuming work. The principal shaft, through which operations are to be carried on, is the Wolfe Tone, situated within a few yards of the productive shaft on the Brookland, and down 709 feet. The shaft and contiguous workings show fine ore, but the great flow of water has so far prevented succes ful mining, although quite large pumping machinery has been provided. Realizing that unusually powerful machinery would be required to handle the water in the Wolfe Tone, a contract has been let to the Knowles Company for two pumps. They will weigh 80,000 pounds, and are to be completed within sixty days. The pumps will be built on the compound, condensing, plunger pattern, calculated to lift 756 gallons 1000 feet a minute. The dimensions of these pumps are as follows: Initial steam-cylinder, 20 inches diameter; condensing-cylinder, 38 inches diameter; plunger, 14 inches diameter; length of stroke, 24 inches. The discharge column will have a diameter of ten inches, and the flow of water will be equal to the discharge of a fifteen-inch Cornish pump, running at average speed and stroke.

PARK COUNTY.

A correspondent of the *Tribune-Republican*, writing from Alma, says: An approximate estimate regarding the amount of ore taken from the Mount Lincoln & Montgomery District can be gained by computing the number of tons shipped to the Boston and Colorado Sampling-Works during the week just completed, which is a fair exponent of the season's business:

Mines.	Tons shipped.	Value per ton.	Total value.
Dolly Varden	55	$100	$5,500
Great West	55	80	4,400
Shamrock	3	150	450
Gertrude	8	200	1,600
Moose	10	200	2,000
Nester	40	75	3,000
Wheeler	12	50	500
Miscellaneous	12	100	1,200
Total	195		$17,750

These figures represent only the ores bought and delivered at ore market, there being several others besides the many tons shipped, both to Leadville and Denver directly, to the smelting companies.

PITKIN COUNTY.

CUMMINGS.—This lode, in Conundrum Gulch, has been leased for one year to Messrs. Doyle, Regan & Co., of Leadville. They are getting out some good mineral.

SAN JUAN COUNTY.

SAN JUAN CHIEF.—New York capitalists have purchased this mine for $30,000.

SUMMIT COUNTY.

GOLD PARK.—At the United States marshal's sale, the property of this mining company was bid in for the amount of the judgment and costs by William T. Dean.

DAKOTA.

FATHER DE SMET.—The report for the week ended September 1st shows ore extracted from the first, second, and third levels, 3000 tons. Ore milled, 3000 tons. Golden Gate east cross-cut, second level, advanced 12 feet; total length, 64 feet. Golden Gate uprise 7 feet. Rise up 21 feet.

IDAHO.

DAVITT & SILVER KING.—The Michael Davitt, Far West, and Silver King claims, owned by this company, have been attached for sums aggregating over $6100.

MEXICO.

The Mexican *Financier* reports the following: Carlos O. Grenfell has been granted an *amparo* for six months on the Mexicana and Alta y Baja California mines, to prevent their denunciation by other parties, on account of abandonment.

Lic. Francisco Hernandez and Pedro Gil have been given possesssion of the Santa Aña mine in Hidalgo.

It is reported that Francisco Garcia recently sold to a prominent banker of the City of Mexico eight shares in the mine, the San Cayetano el Bordo, Pachuca, at $700 a share.

The ore extracted from La Paz in Matehuala, San Luis Potosi, is proving fully as good as was expected when the bonanza was first discovered. It averages from 18 to 20 marks silver and 6 ounces gold.

The following mines have been denounced: A vein of gold, situated in the hill of Remedios, Durango, by Crescencio Silva and Gregorio Sepulveda. The ore is said to produce four ounces a carga. In San Miguel, Zacatecas, a mine called Tesoros de Monte Cristo, by Daniel Cardona & Co., with a vein running from south to north and touching the Buenaventura on the south. In the city of Zacatecas, by William Krafs and R. S. Lee, a mine called La Cruz, situated in the hill of the same name, to the northwest of the town, its vein running from east to west, and having no contact with other mines. In Tulancingo, Hidalgo, a silver vein, by Marcial Barrios and partners. In Zimapan, a prospect called La Argentina, by Homobono Ibarra and Juan Pablo Ramirez; an old mine, La Colmena, by Domingo Espino, I. Martinez and others; and a new vein called San Rafael, by Nestor Gonzalez and partners.

The bonanza in the San Judas mine, situated in the mining town of the same name, is remarkable for the abundance and quality of its ore. The water was only recently removed, and ore was extracted in such quantities that it could not all be worked in San Judas, and it has been found necessary to send part of it to Pachuca, where it is reduced in the *patio*, mixed with Pachuca ore in the proportion of twenty per cent. and giving good results.

At fourteen leagues' distance from Hermosillo, is situated the Mina Prieta, which has a vein eight feet in width, averaging $10 a ton. The principal shaft is 500 feet deep, with stations at every 100 feet communicating with the respective levels. The ore is raised from the main shaft by means of a steam-engine of 70 horse-power and the water is forced out by a steam-pump with six-inch tube. There are three pumps of the same capacity, within the shaft, to raise the water from one level to another. The number of men employed is one hundred and forty, and an average of one hundred tons of ore, containing silver and gold, is extracted daily.

MICHIGAN.

COPPER MINES.

The production of the mines mentioned for the month of August has been as follows:

	Tons.		Tons.
Calumet & Hecla	2277	Allouez	102
Atlantic	182	Copper Falls	59
Franklin	176	Hancock	36
Huron	118		

GOLD MINES.

ROPES.—The machinery for the new mill has arrived, and is erecting. The cost of the new plant will be about $14,000.

IRON MINES.

BARNUM.—The working force of this mine has again been reduced.

NATIONAL VS. MINNESOTA.—The jury in the suit of the National Mining Company against the Minnesota Mining Company, for trespass and damages, was concluded September 1st, resulting in a verdict of $11,962.95 for the National. The declaration claimed $100,000.

MONTANA.

Press dispatches state that there is great excitement at Benton over the confirmation of an important gold discovery in the Little Rocky Mountains, 100 miles northeast of that place. About one hundred claims have been taken up. Those worked pay from $6 to $11 a day to a man working with the ordinary gold pan.

LEWIS & CLARKE COUNTY.

Elijah M. Dunphy, of Helena, has recently purchased and now owns exclusively the General Grant, General Sherman, and General Jackson lodes, and three fourths of the Good Friday, besides the water-rights, ditches, etc., formerly owned by Andrew J. Arnold and others on Red Mountain in the vicinity of the Nellie Grant mine—a large proportion of which is also owned by Mr. Dunphy. It is understood that within a short time these properties will be developed by a large tunnel driven into the mountain so as to cut the several lodes at about right angles and at a depth that will not only determine their character as mines but open up extensive ground for stoping.

BALD MOUNTAIN.—A tunnel is running into the mountain on the Buckeye lode, to strike the vein at a depth of 250 feet below the present shaft, which is now fifty feet deep and shows the vein at the bottom to be about three feet wide. At the present lowest point reached, it is claimed that the pay-streak carries from 50 to 80 ounces of silver to the ton. Both walls are of granitic formation, and the indications are good for a permanent mine on further developments.

CLANCY CREEK.—Ore has been struck in the tunnel at a distance of 170 feet from the surface, and the vein-matter has been explored for a distance of six feet across from the first wall encountered without reaching the other wall. There seems to be slate on one side and a porphyry dike next to the granite formation on the other side. Assays of the ore brought away as an average of the output indicate a value of from 30 to 40 ounces of silver to the ton.

SILVER BOW COUNTY.

ANACONDA.—Work is still going on at the mine, but no ore has been taken out for a few days. Some repairs were to be made soon, and it was thought best to make them before the big smelter fired up. The air-compressor in the mine is undergoing some repairs; also some repairs are making in the shaft. The Anaconda and St. Lawrence mines are putting in a new station. As soon as these repairs are completed, the usual work will be resumed with the usual force of men. It is expected that the smelter will be fired up on the fifteenth inst.

NEVADA.

EUREKA COUNTY.

About 100 miners, members of the Union, marched from Ruby Hill to the Lord Byron mine, September 2d, and stopped the men who were at work there. From there they marched over to the Dunderburg, where they did the same. It is stated that the men stopped were working for less than regular wages.

EUREKA CONSOLIDATED.—The special meeting of this company to be held for the election of new trustees, has been revoked. The matter has been amicably settled.

HUMBOLDT COUNTY.

Mr. Holger Birkedal, President of the Nevada Niter Company, publishes the following in answer to a communication that appeared in the ENGINEERING AND MINING JOURNAL and in San Francisco papers; and signed B. F. Dahl, F. C. Leavitt, M. Southard, C. H. Mason, and others, in which it is claimed that *all* the niter deposits in Humboldt and Churchill counties have been located by the signers and their "friends":

OFFICE OF COUNTY RECORDER AND AUDITOR,
WINNEMUCCA, HUMBOLDT CO., NEV.,
August 5, 1884.

J. W. SMITH, ESQ., *San Francisco, Cal.:*

DEAR SIR: Yours received this day. I have examined the records in my office, and do not find any of the names on the printed notice sent me in the index to location notices in this office. If they have made any locations, such locations are not recorded in this office. Peck, Emmons, and others have notices of niter locations recorded in this county. Yours truly,

J. J. HILL, Recorder.

STOREY COUNTY.

The case of the Sutro Tunnel Company *vs.* the Segregated Belcher was concluded at San Francisco September 3d. Judge Rising reserved his decision.

NEW MEXICO.

SOCORRO COUNTY.

BILLINGS SMELTER.—The stack for the new copper furnace at the Billings smelter at Socorro has been completed.

DEMING SMELTER.—The smelter has closed down on account of the scarcity of wet ores.

CABINET CONSOLIDATED.—Active preparations are making to get the Torrence mine in working order.

UTAH.

The receipts of bullion at Salt Lake City, for the eight months of the present year, excluding receipts of ore, have aggregated $3,647,332.

SUMMIT COUNTY.

CRESCENT.—The concentrating mill planned in its methods and machinery by Mr. B. B. Van Deusen, will embody all that has been recently learned respecting the concentration of lead ore. Rolls will be used for crushing. The ore will be delivered automatically into revolving sizing-screens, set one below the other, five or six of them, the different sizes save the slums going then to jigs. The slums will go to Rittinger tables or similar tables, and it is believed that 90 per cent of the lead can in this way be saved. The loss in silver will depend on the amount of silver in the quartz, which will all be dressed out, and in the form of chloride.

FINANCIAL.

Gold and Silver Stocks.

NEW YORK, Friday Evening, Sept. 12.

There is nothing new to report in the mining market. Continued dullness characterized the market this week, and business was almost stagnant. The Comstocks ruled steady, and were very quiet. The Leadville stocks were also steady, and so were the Bodies and the Tuscaroras. Horn-Silver was irregular, with small transactions. We give a complete summary of the market below. The total number of shares sold was 29,930, as against 46,275 last week.

The Comstock shares were very quiet, and sold at steady prices. California was quite strong early in the week, but declined toward the close; it sold at from 53@35c. Consolidated Virginia records a small business, and was a little weak; it sold at from 28@23c. Sierra Nevada was quite strong, selling at from $1.30@$1.65, with a small business. Union Consolidated sold at steady prices, and was moderately dealt in; it was quoted at from $1.20@$1.30. Sutro Tunnel was quiet and steady, selling at from 18@17c.

The Leadville stocks were quiet and steady. Amie sold at from 6@7c., with a small business. Chrysolite was moderately dealt in at irregular prices; it sold at from 85@75@80c. Breece was quiet and steady, selling at from 28@30c. Little Chief sold at 28c.

The Bodie stocks were very quiet. Standard was quiet and irregular; selling at from $1.50@$1.25@$1.30. Consolidated Pacific was quite strong, and was moderately dealt in; it sold at from 50@60c.

The Tuscarora stocks record a small business at steady prices. Grand Prize sold at 38c. Belle Isle sold at 48c. Navajo was quiet and steady, selling at from $4@$3.90.

In the miscellaneous list, Alice sold at $2.60. Bassick records one small transaction at $5.38. Eureka Consolidated was moderately dealt in at strong prices; it sold at from $2.60@$3. Green Mountain sold at $1.80. Horn-Silver was quiet and irregular, selling at from $5.63@$6@$5.75.

Barcelona was quiet and steady, selling at from 12@13c. Central Arizona sold at 22c., and was moderately dealt in. Oriental & Miller was quiet and steady at 12@13c. Rappahannock was moderately dealt in at steady prices, selling at from 15@17c.

DIVIDENDS.

The Adams Mining Company, of Colorado, has declared a dividend of ten cents a share, or $15,000, payable on and after September 20th.

The Delaware & Hudson Canal Company has declared a quarterly dividend of one and three quarter per cent on the capital stock, payable on and after September 10th.

The St. Joseph Lead Company, of Missouri, has declared a dividend of two per cent on the capital stock, payable on and after September 20th.

PIPE LINE CERTIFICATES.

Messrs. Watson & Gibson, petroleum brokers, No. 49 Broadway, report that the past week has been a disastrous one to the bulls in this commodity. From 92½c. a week ago Wednesday night to 72½c. Thursday of this week, shows a net decline within eight days of 20c. a barrel. The market closed to-night at 75¾c., or a recovery of 3¼c. from the lowest figures of the break. This severe decline was started by the announcement that at Baldridge the Phillips well had made a phenomenal showing. Starting off last Thursday week at 50 barrels an hour, it not only maintained but increased its output until it reached 90 barrels an hour after deeper drilling. It is now yielding about 75 barrels an hour, and declining, and as it is slow and expensive drilling wells there, it is likely that it will drain more of that territory before any other wells reach the sand. It was a great scare; but when every body is frightened is the best time to buy a staple commodity like oil.

The following table gives the quotations and sales at the New York Mining Stock and National Petroleum Exchange:

	Opening.	Highest.	Lowest.	Closing.	Sales.
Sept. 6	$0.85⅝	$0.86½	$0.78½	$0.79⅜	12,794,000
8	.79	.79	.73½	.77	10,529,000
9	.77	.78⅞	.73⅛	.77⅜	9,175,000
10	.77¼	.78⅜	.74¼	.74⅜	7,479,000
11	.74¼	.75⅜	.72⅜	.74⅛	11,070,000
12	.73⅜	.76¾	.73⅜	.75¾	6,202,000
Total sales					57,249,000

SAN FRANCISCO MINING STOCK QUOTATIONS.
Daily Range of Prices for the Week.

NAME OF COMPANY.	CLOSING QUOTATIONS. Sept. 5.	Sept. 6.	Sept. 8.	Sept. 9.	Sept. 10.	Sept. 11.
Albion	...	...	...	...	...	...
Alpha	...	...	...	...	...	...
Alta	2	2⅛	2¼	...	2¼	2⅛
Argenta	...	...	...	...	...	...
Bechtel	...	...	...	...	...	...
Belcher	.85	.80	.80	...	.90	...
Belle Isle	...	...	...	...	...	...
Best & Belcher	2¼	2⅜	2½	...	2⅜	2¼
Bodie	2	2	2	...	2	2
Bullion	...	...	...	...	...	...
Bulwer	...	...	...	...	...	...
California	.35	.55	.45	...	.40	.30
Challar	2½	2½	2¼	...	2½	2¼
Con. Pacific	.55	.60	.65	...	.65	.60
Con. Virginia	.25	.25	.25	...	.25	.20
Crown Point	.1⅜	...	1⅜	...	...	...
Day	.75	...	...	...	...	...
Elko Cons	...	...	...	...	...	...
Eureka Cons	...	...	...	...	2¾	3
Exchequer	...	...	...	...	...	...
Gould & Curry	2	2	2	...	2⅛	2
Grand Prize	...	...	...	...	...	...
Hale & Norcross	2⅞	3	2⅞	...	3	2⅞
Independence	...	...	...	...	...	...
Martin White	...	...	...	...	...	...
Mexican	1½	1½	1⅝	...	1⅝	1¾
Mono	...	...	...	...	...	...
Mount Diablo	...	...	...	...	...	...
Navajo	.3¾	3⅞	3⅞	...	3⅞	3¾
Northern Belle	...	...	...	...	...	...
North Belle Isle	...	...	...	...	...	...
Ophir	.1⅛	1⅛	1¼	...	1⅜	1⅜
Overman	...	...	...	...	...	...
Potosi	.1½	1½	1⅜	...	1½	1⅜
Savage	.1¼	1¼	1¼	...	1⅜	1¼
Scorpion	...	...	...	...	...	...
Sierra Nevada	.1⅜	1⅜	1½	...	1½	1⅝
Silver King	...	...	...	...	...	...
Tip Top	...	...	...	...	...	...
Union Cons	.1¼	1⅛	1¼	...	1¼	1¼
Utah	.50	...	...	...	.80	.80
Wales Cons	...	...	...	...	...	...
Yellow Jacket	1¾	1¾	1¾	...	1¾	1⅞

The following were the financial balances of the various mining companies on July 1st:

CASH ON HAND.

Alta	$1,938.71	Gould & Curry	$37,588.25
Andes	2,182.45	Hale & Norcross	32,966.12
Alpha Con	11,468.64	Martin White	1,264.50
Bulwer	5,345.90	Mono	16,768.66
Bodie Con	91,605.03	Mexican	38,120.2
Best & Belcher	35,947.09	Ophir	41,429.38
Benton Con	20,860.54	Occidental	3,252 38
*Belcher	16,170.88	Potosi	6,727.88
Challar	36,514 19	Sierra Nevada	54,471.50
Crown Point	25,162.92	Summit	89.88
†Con. Virginia	24,066.54	Savage	9,795.32
Exchequer	9,811.14	Utah	5,274.34

INDEBTEDNESS.

California	$4,970.10
Lady Washington Con.	3,285.23
Standard	8,282.23

Albion indebtedness, exact amount not known; approximate, $265,000.

*Due Sutro Tunnel Company, $10,920.
†Monthly expenses at mine, amount unknown.

Boston Copper and Silver Stocks.

[From our Special Correspondent.]

BOSTON, Sept. 11.

The market for copper stocks the past week has been heavy and weak, especially in Quincy, and this is doubtless owing to the decline in ingot copper. A sale of lake was said to have been made by the syndicate of from 5,000,000 to 10,000,000 pounds at 13 cents. At this price, there is not much margin of profit for most of the companies, and future dividends will probably be at reduced figures. The effect has been most marked in Quincy, holders of which have pressed the stock for sale, resulting in a decline from $36½@$29¾, the lowest price being made at to-day's Board, the stock closing weak and offered at $29¾, no bid. Calumet & Hecla has not felt the effect to the same extent as Quincy, owing to its strong position and the fact that the cost of production is much smaller, and that it can sell copper at 13 cents and still be able to make fair returns to the stockholders. We look, however, for lower prices, as there is not much disposition to invest in the stock, and any considerable amount of stock put on the market and pressed for sale would have to be sold at much lower figures. The stock was fairly steady in the early dealings at $166, but later sales were made at $165@$164¼, mostly in small lots. Osceola declined from $11 to $10½. Franklin sold same as last week, at $7. The product of the Calumet & Hecla for August was 2276½ tons, and the Quincy about 335 tons. The rest of the list was neglected, and quotations nominal.

In silver stocks, the market continues dull, and very little doing. Bonanza sold at $1⅛@$1¼. Catalpa at 27½c. Bowman Silver, steady, at 12@13c.; only about 2500 shares were sold on Saturday for non-payment of assessment. Dunkin selling at 22@24c., ex dividend 5 cents. Sullivan is offered at 10c.; the sale of delinquent stock has been postponed until the 27th inst. The Meter stocks are quiet. New England sold at 37½@40c., and standard at 50@52½c. There is a little demand for Breece at 22@23c.

3 P.M.—There were no sales of copper stocks at the afternoon Board, and the market was very heavy. The best bid for Calumet & Hecla was $160, and for Quincy $28 was bid and $29 asked. Atlantic, $6 bid, $7½ asked. Franklin offered at $7½, no bid. Osceola, $10 bid. Pewabic, $1½ bid, $2 asked.

BULLION MARKET.

NEW YORK, Friday Evening, Sept. 12.

The London market for silver, the India Exchanges, and our sterling exchange market have varied so little for some time past as to have left our figures for silver practically unchanged.

DATE.	London. Pence.	N. Y. Cents.	DATE.	London. Pence.	N. Y. Cents.
Sept. 6	50¾	110¼	Sept. 11	50 11-16	110⅛
8	50¾	110¼	12	50 11-16	110⅛
10	50 11-16	110⅛	13	50 11-16	110⅛

BULLION PRODUCTION FOR 1884.

MINES.	States.	Month of July.	Year from Jan. 1st, 1884.
		$	$
*Alice, G. S.	Mont.	† ...	520,843
*Belmont	Mont.	...	8,081
*Black Bear	Cal.	2 500	19,600
Bodie, G.	Cal.	...	396,063
*Bonanza King, S.	Cal.	...	211,904
*Boston & Montana, G.	Mont.	33,756	273,535
*Caledonia	Dak.	...	73,511
*Chrysolite, S. L.	Colo.	13,113	98,478
*Consolidated Bobtail, G.	Colo.	9,791	57,071
†Contention, S. G.	Ariz.	...	314,929
*Deadwood-Terra, G.	Dak.	...	260,923
*Derbec Blue Gravel, G. S.	Colo.	16,196	89,813
*Father de Smet, G.	Dak.	43,592	267,637
Grand Prize, S.	Nev.	...	25,000
*Hecla Cons., G. S. L. C.	Mont.	‡ ...	320,052
*Helena, S. L.	Mont.	106,250	625,036
*Homestake, G.	Dak.	...	607,988
*Hope, S.	Mont.	...	39,301
Horn-Silver, S. L.	Utah	...	1,244,000
*Iron Silver, S. L.	Colo.	...	381,356
*Kentuck, G. S.	Nev.	1,717	20,577
*Lexington, G. S.	Mont.	96,794	709,479
*Little Pittsburg, S.	Colo.	3,355	56,304
*Moulton, G. S.	Mont.	61,241	432,147
*Mount Diablo, S.	Nev.	...	24,820
*Murchie	Cal.	...	19,000
*Navajo, G. S.	Nev.	34,667	243,697
North Belle Isle	Nev.	5,874	5,874
*Ontario, S. L.	Utah	...	1,021,841
*Original, S. C.	Mont.	...	29,724
*Oxford, G.	N. S.	2,471	22,378
*Paradise Valley, S. G.	Nev.	16,000	87,950
*Plymouth Consolidated, G.	Cal.	91,189	623,546
*Rooks, G.	Vt.	6,328	28,661
*South Yuba, G.	Cal.	2,400	18,016
*Stormont	Utah.	17,847	117,595
*Syndicate, G. S.	Cal.	14,067	98,078
*Tombstone, S. L.	Ariz.	...	370,078
United Gregory, G.	Colo.	...	7,174
Total amount of shipments to date			$9,972,060

* Official. † Assay value. ‡ Not including value of lead and copper. ** Silver valued at $1.05 an ounce. G. Gold; S. Silver; L. Lead; C. Copper. —— No bullion produced.

Foreign Bank Statements.—The governors of the Bank of England, at their regular weekly meeting, made no change in the bank's minimum rate of discount, and it remains at 2 per cent. During the week, the bank lost £157,221 bullion; but the proportion of its reserve to its liabilities was increased from 44½ to 45¼, against 46¼ per cent at this date last year. The weekly statement of the Bank of France shows losses of 2,566,000 francs gold and 2,718,000 francs silver.

IRON MARKET REVIEW.

NEW YORK, Friday Evening, Sept. 12.

American Pig.—Deliveries by some of the furnace companies continue heavy, but new business is light, since no concessions are granted in No. 1 Foundry or Gray Forge. No. 2 Foundry is, however, more abundant and is unsettled.

We quote standard brands: No. 1 Foundry, $20@$21; No. 2, $18@$19; and Gray Forge, $17@$18, with outside brands about $1 lower. Foreign Bessemer is nominally $19@$19.50. Spiegeleisen is nominally $27@$27.50 for 20 per cent, a small business having been done during the week.

Scotch Pig.—Business continues very light.

We quote ex ship and to arrive: Langloan, $21.50 Summerlee, $20.75; Dalmellington, $20; Gartsherrie, $21; Eglinton, $19.25@$19.50; and Glengarnock, $20@$20.50.

NEW YORK MINING STOCKS.

DIVIDEND-PAYING MINES.

NAME AND LOCATION OF COMPANY.	Highest and Lowest Prices per Share at which Sales were Made.												SALES.
	Sept. 6.		Sept. 8.		Sept. 9.		Sept. 10.		Sept. 11.		Sept. 12.		
	H.	L.	H.	L.	H.	L.	H.	L.	H.	L.	H.	L.	
Alice, Mon.							2.60						100
Amie Con., Co.							.07		.07	.06	.07		2,800
Argenta													
Bassick, Co.							5.38						50
Belle Isle, Ne.											.48		300
Bodie Cons., Ca.													
Breece, Co.			.28						.30				300
Bulwer, Ca.													
California, Ne.	.40		.53	.50					40		.35		1,700
Cal. & Hecla, Mich.													
Castle Creek													
Chollar													
Crysolite, Co.					.85				.82	.80	.80	.75	2,700
Cons. Va., Ne.	.28		25	.23	.24				.24		.23		5,950
Copper Queen													
Dunkin, Co.													
Eureka Cons., Ne.	2.80	2.60	3.00	2.80					2.90		3.00	2.90	1,300
Father de Smet, Dk.													
Findley, Ga.													
Gold Stripe, Ca.									.01		.01		1,500
Gould & Curry, Ne.													
Grand Prize, Ne.											.38		200
Green Mountain, Ca.			1.80										200
Hale & Norcross, Ne.													
Hall-Anderson, N. S.													
Homestake, Dk.							9 25						55
Horn-Silver, Ut.	5.63				6.00				5.75				325
Independence, Ne.													
Iron Silver, Co.													
Leadville C., Co.													
Little Chief, Co.									.28				600
Little Pittsburg, Co.													
Martin White, Ne.													
Navajo, Ne.	3.90		3.90		4.00				4.00		4.00	3.90	800
Northern Belle													
North Belle Isle, Ne.													
Ontario, Ut.													
Ophir, Ne.													
Quicksilver Pref., Ca.													
" Com., Ca.													
Robinson Cons., Co.													
Savage, Ne.													
Sierra Nevada, Ne.	1.40		1.30								1.35		500
Silver King, Ar.									4.00				150
Spring Valley, Ca.													
Standard, Ca.	1.45		1.50	1.30			1.25		1.30				800
Stormont, Ut.													
Tip Top, Ar.													
Vizina, Ar.													
Yellow Jacket													

NON-DIVIDEND-PAYING MINES.

NAME AND LOCATION OF COMPANY.	Highest and Lowest Prices per Share at which Sales were Made.												SALES
	Sept. 6.		Sept. 8.		Sept. 9.		Sept. 10.		Sept. 11.		Sept. 12.		
	H.	L.	H.	L.	H.	L.	H.	L.	H.	L.	H.	L.	
Albion													
American Flag													
Barcelona, G.					.13		.13	.12					1,000
Bechtel Con., G.													
Belvidere													
Best & B'licher, G. S.													
Big Pittsburg, S. L.													
Bradshaw, S.													
Bull-Domingo, S.L.													
Cal., B. H., G													
Central Ariz'na, S.			.22				.22		.22				900
Climax, Co.													
Colorado Central.													
Cons. Imperial.													
Con. Pacific	.55		.55	.53	.60	.55	.60	.58	.60		.60		4,000
Decatur													
Durango, G.													
Eastern Oregon									.03				500
Goodshaw, G.													
Harlem M. & M. Co.													
Hortense, S.													
Lacrosse, G.													
Mariposa Pref., G.													
" Com., G.													
Mexican, G. S.													
Mono													
North Standard, G.													
N. Horn-Silv'r, S. L.													
Pri'nt'l & Miller, S.									.13	.12			200
Rappahannock, G.	.16		.17	.16			.15						1,300
Red Elephant, S.													
Ruby, of Arizona.													
Silver Cliff, S.													
Sonora Con.													
South Bodie, G.													
South Bulwer, G.													
South Hite.													
South Pacific.													
State Line, 1 & 4, S.													
" Nos. 2 & 3, S.													
Sutro Tunnel							.18	.17			.17		1,200
Taylor Plumas													
Unadilla, S.													
Union Cons., G. S.			1 20								1.30		500

Full tables giving the total amount of dividends, capital, etc., will be printed the first week of each month. Dividend shares sold, 20,830 Non-dividend shares sold, 9,600.

At the Metal Exchange, the following cable quotations have been received: Coltness, 59s. 6d.; Langloan, 54s. 6d.; Summerlee, 52s.; Gartsherrie, 52s. 3d.; Glengarnock, at Ardrossan, 49s. 6d.; Dalmellington, 47s.; and Eglinton, 43s. 3d. Warrants, 41s. 7d.

Steel Rails.—Considerable business has been done and better prices have been realized. Thus, one mill has sold to-day 6000 tons of rails at $28 at mill. The bulk of the business during the week has, however, been done at $27 at mill.

Old Rails.—Nothing of consequence has been done. We quote $18@$18.50.

Philadelphia. Sept. 12.

[From our Special Correspondent.]

Pig-Iron.—A little more firmness is to be noted in all good makes of pig-iron, and a slight increase in inquiry, without any very heavy transactions, however. Most consumers are in need of stocks, and a good many contracts for supplies to last through the fall are likely to be placed at an early day, as there is no probability that irons of desirable quality will go any lower than they are at present, while there is possibility that for a few makes prices may improve, owing to the very light production and the fact that the companies making these irons are well sold up. Holders of standard and special brands are refusing to grant concessions, but large lots of inferior stuff can still be had at very low figures. Quotations show no change. No. 1 iron ranges from $19@$20.50; No. 2, which is in larger supply and very dull demand, can be had all the way from $17.50@$18.50, according to quality. A good many small lots of Forge iron are selling at $17@$17.50 for good and $18 for best. Low grades of iron are to be had at $16. Mill-owners have made some inquiries, but are not in the humor to stock up heavily, while the demand for the finished product is so unsatisfactory.

Foreign Irons.—Sales of 80 per cent ferro-manganese have been made at $73.50 and of 60 per cent at a shading from $55. A good deal of inquiry prevails, and other sales are probable. Twenty per cent spiegeleisen is wanted, and would probably sell in 500 and 1000-ton lots at about $27. Bessemer is without activity, and is quoted, as usual, at $19. Foreign Steel Blooms are offered at $40@$41.

Merchant Bar.—No change is to be reported in this market. The demand is steady and for small lots mainly, though the business for the week aggregates a good deal. But it is difficult to secure large orders, partly owing to the competition of cheap Western iron, and the mills are very few of them able to keep going double turn. There are very few orders ahead in most of the mills. Prices are consequently low, and no improvement is probable. For small lots of Best Refined, 1·90c. is paid. Common iron ranges from 1·60@1·80c.

Muck-Bars.—Small sales of Muck-Bars are made at from $29@$30.50, but inferior makes have sold at $29, and even a little less.

Blooms.—There is nothing doing in a large way, and quotations are unchanged.

Nails.—Quotations are nominally $2.20@$2.25, but sales are made at $2.15@$2.20. Demand has improved slightly, but the improvement is not likely to be permanent.

Plate and Tank-Iron.—No business of importance has been transacted in plate and tank-iron. Small orders continue to come in, and the mills are quite busy, but with very few orders for future delivery. Quotations are 2@2·10c. for Plate; 2·15c. for Tank; 2·75c. for Shell; 3·75c. for Flange; and 4·25c. for Fire-Box.

Structural Iron.—The Baltimore & Ohio Railroad Company is in the market for 10,000 tons of bridge iron. It has just placed an order for 5000 tons in Pittsburg. No large orders have been taken by manufacturers here, but there are some inquiries that, it is thought, result in business. Competition is still active, and heavy concessions would be allowed on a large order. Only small lots are selling from day to day, at 3·10c. for Angles, 2·75c. for Tees, and 3·50c. for Beams and Channels. Bridge Plates, 2·25c.

Steel Rails.—A great deal of business has been closed during the past week. A lot of 22,000 tons sold here at $27.50 on time. A sale of 10,000 tons is rumored, at $26 at mill. The mills are beginning to fill up pretty well, and prices have begun to stiffen a little during the past few days. But it is not likely that any material advance will be attempted. Most of the business has been done at $26.75@$27 at mill, although exact figures are seldom to be obtained.

Old Rails.—At about $1 less than asking prices, several lots of T rails could be moved; but buyers are not in a hurry for stocks, and as holders are firm at $19 for small lots of good rails, very little is done. Brokers are trying to negotiate sales, but nothing can be done at present, except on lower terms than they are willing or able to accept. Bridge Rails are offered at $21, and Bull-Heads at $20.

Scrap-Iron.—There is nothing doing in Scrap, outside of a few small sales. Prices are less firm than they have been, and are quoted at $20@$20.50 for Best No. 1 Selected, and $19@$20 for inferior kinds.

METALS.

NEW YORK, Friday Evening, Sept. 12.

Copper.—The market has been quiet, the only movement being export sales of Arizona copper at a figure slightly above 12½c., the quantity being about 600 tons. The Lake companies decline 12½c. for export orders. Nominally, we quote Lake copper 13¼c., and other brands 12½@13c.

England cables £53 17s. 6d. for Chili Bars and £59 for Best Selected.

Messrs. James & Shakspeare have published the following statistics of copper for the first eight months:

	Aug 1 to 31.—Imports.	Deliveries.	
Fine foreign, chiefly Australian	Tons. 1,028	Tons. 1,078	London.
Chili: Bars	755	1,686	
Chili: Ingots	136	346	
Chili: In ores and regulus	97	483	Liverpool and Swansea.
American, chiefly furnace material	1,878	1,727	
Spanish precipitate and sundries	2,214	1,692	
Totals—England	6,108	7,012	
American, chiefly ingots	725	635	
Chili bars, ingots, and Barilla	577	949	France
Sundries	25	35	
Totals — England and France	7,435	8,631	

	Stocks.—Aug. 31.	July 31.	
Fine foreign, chiefly Australian	Tons. 3,463	Tons. 3,513	London.
Chili: Bars	22,003	22,934	
Chili: Ingots	100	310	
Chili: In ores and regulus	758	1,144	Liverpool and Swansea.
American, chiefly furnace material	256	105	
Spanish precipitate and sundries	4,629	4,107	
Totals—England	31,209	32,113	
American, chiefly ingots	350	260	
Chili bars, ingots, and Barilla	1,013	1,385	France.
Sundries	Nil.	10	
Totals—England and France	32,572	33,768	

Advised by mail and telegram:

	Tons.	Tons.
Chili	9,190	7,776
Australian	775	1,050
Total visible supply	42,537	42,594

Jan. 1 to Aug. 31.

	Tons. 1884.	Tons. 1883.	Tons. 1882.
Imports	63,630	60,421	51,353
Deliveries	70,901	58,810	53,609

Tin.—The market has been quiet with Straits spot at 18·25c., and Straits in London cabled at £81 17s. 6d.

Lead.—During the week, sales aggregating 500 to

600 tons have been made, Common realizing 3·55c. and Refined 3·60c. The market is quiet, but fairly firm, comparatively little lead being obtainable at these low figures. On the other hand, the demand is light.

From St. Louis, Messrs. John Wahl & Co. telegraph to us as follows to-day:

Our market is rather quiet, and a weak tendency is to be noted, although there are no changes in quotations. Sales for the week sum up 150 tons of Refined lead at 3·37½c., 300 tons at 3·40c. for delivery during the last week of September, and 250 tons of Chemical lead for delivery during the early part of the week at 3·37½c. at East St. Louis.

From Chicago, Messrs. Everett & Post send us the following dispatch:

Business has been quiet and of a limited character, with quotations at 3⅝@3·40c. There is but little doing, and the demand is from hand to mouth only. Offerings are only moderate, but more than enough for current demands.

Spelter.—Domestic is offered on the spot by dealers at 4·60c. Some Silesian long held here has been at last marketed at 4⅝c., while Stolberg spelter is offered for any time delivery during the year at 4·75c. London cables £14 for Silesian.

Antimony.—The market is quiet and unchanged.

COAL TRADE REVIEW.

NEW YORK, Friday Evening, Sept. 12.

Anthracite.

In a few days, whatever little impression the stoppage of last week made upon accumulated stocks will have disappeared, and with full-time work going on again, every available place for the carrying of coal in stock by the companies will be choked. With matters running along for any length of time as they are doing now, the crisis can not be far off. Buyers are indifferent, sellers anxious. The tonnage can only be moved by cutting in prices, and this is done all around, almost without disguise; $3.50 alongside for chestnut, and $4 alongside for stove fairly represent the market, though lower figures than these are not uncommon.

The majority of the companies are willing, yes, eager for another week of suspension. The only company that has declined even to argue the question is the Delaware, Lackawanna & Western. We are not informed as to the motives that actuate Mr. Sloan in taking so peculiar a position; but we fail to understand how one who might be supposed to be posted on the condition of the coal trade can imperil the great interests in his charge, by absolutely closing his eyes to facts, and refusing even to discuss the situation. It is stated that the Delaware, Lackawanna & Western is supposed to pursue a "transportation policy." Such a "policy," so called, would in two months' time end in $2 coal. Last Friday, the Delaware, Lackawanna & Western was reported to have 2000 loaded cars standing at Buffalo and 8000 cars at this end of the line, so that, after all, its "transportation policy" does not appear to amount to much. By large concessions in prices, it may move all its coal at a good profit, but it would not take long to kill the goose that laid the golden eggs. The position of that company is one that lays its managers open to the perplexing dilemma of explaining it either by the confession that they have not kept posted as to the position of the coal trade or that they are pursuing objects not compatible with a continuance of harmony among the anthracite coal companies.

Philadelphia. Sept. 12.

[From our Special Correspondent.]

The stocks of coal at Port Richmond are 56,000 tons. A gradual accumulation is in progress. At the opening of the week, the supply was 51,000 tons. There is talk of a further restriction, but no time has been fixed upon for it. The Reading Company is unable to get coal fast enough, and vessels are waiting for days for an opportunity to get loaded. Freights are still $1 per ton to Boston, but these rates are too low to attract much tonnage this way, and it is probable that, in seeking for tonnage elsewhere, rates here will advance 10 or 15 cents. There is a great deal of shading going on, and nothing of special importance to be noted, except that there is a large amount of inquiry; but for various reasons, the inquiries do not result in as much business as the real requirements of the country demand. The Eastern markets are doing well, but could do a great deal better. The dullness in manufacturing circles there is felt here; but it is not likely that the conditions of the market will justify any departure from the hand-to-mouth policy, although there is nothing to be gained by delay. The Philadelphia & Reading Company carried 1346 tons last week, against 280,458 tons for the same week last year; total to date, 8,369,214 tons, against 7,782,632 tons for the same time last year—an increase of 586,581 tons. The decrease on the Schuylkill Canal up to date, for this season is 31,151 tons. When the time comes to restrict, there will be very little opposition to it, excepting by the Reading, and that company will not make any serious objections to a reasonable stoppage. The demand throughout Eastern Pennsylvania continues light, but there is more inquiry, owing to the fact that manufacturers have no stocks on hand and are willing to buy at current rates. The anthracite production, so far as reported, foots up 18,750,000 tons, or 960,000 tons less than for the same time last year. The Western markets are still rather backward, but there is an abundant field there for coal, and when the buyers start in, the shipments will be heavy. The local demand is still light. One reason for this is, the continued agitation of a local paper, which is endeavoring to persuade the people that coal must come down. The intentions of this journal are good enough, and perhaps there is reasonable cause for the complaints made; but the effect is, to keep buyers out of the market, and enable the coal companies to advance prices 25 cents a ton after a while.

The production of Clearfield coal for the week ended September 6th, as reported to-day, is 61,264 tons, against 55,471 tons for the same week last year—an increase of 5793 tons. Last year's production to this date, was 1,992,812 tons; this year's production, 2,115,556 tons; showing an increase this year of 197,743 tons. The Cumberland production for last week was 49,054 tons; up to date this season, 1,887,579 tons.

Buffalo. Sept. 11.

[From our Special Correspondent.]

Writing with the thermometer at 91 degrees in the shade is not an enviable task. The subject, coal—suggestive of wintry blasts—does not have any effect in cooling the body, neither does it give activity to the brain. Luckily, there is little news, and so this communication will be brief.

Anthracite and bituminous coal remain as last written up. Coke is also steady and unchanged.

The superintendent of the Board of Trade building has discontinued the burning of soft coal, and has purchased a supply of anthracite pea.

The New York Central Railroad people have recently used an appliance on their engines which consumes the smoke most effectually, and intend adopting it generally. The Erie Railroad is following suit. All new engines are to burn anthracite coal exclusively. The Lake Shore Railroad is studying the problem.

In the suit brought by the city in the Municipal Court against Messrs. Sweet for maintaining a nuisance—that is, burning bituminous coal in violation of the city ordinance—the defendants were fined $10 and costs. This precedent will doubtless have the effect of discontinuing the burning of soft coal in our factories. The plaintiff claimed that bituminous or soft coal and shavings were burned at this factory, and that the smoke and soot issuing from the chimney were swept all over the neighborhood, to the annoyance and distress of the people residing in the vicinity. Housekeepers complained that the family washing on the clothes-lines was frequently ruined by the smoke; that the furniture was destroyed by the soot; and that the nuisance made it impossible for many to sit out on their stoops with convenience; while in the mornings, when the fire in the factory was often started, the thick, black smoke often woke up the neighbors on the point of suffocation. Deputy City Attorney Browne cited, among other authorities, a decision handed down in the Supreme Court in Chicago not long ago, in which it was held that the smoke, even from tugs and passing locomotives, if annoying to the people along the line of their course, must be abated. This decision shows that the Common Council had the power legally to make the ordinance.

The movement of coal by lake since my last letter has been light; stocks for shipping nearly exhausted, so that vessels have had to experience delay in procuring cargoes. Many propellers, barges, and sail vessels have left the port without loads, not caring to await resumption at the mines. Freights as a result have been unchanged; it has been, "Take 50c. or leave light." The lake interests have suffered this season, and it is to be hoped that the few weeks of navigation remaining will see freight at such rates as will equalize at least the losses and the profits.

Charters were made during the past week at the following rates: To Chicago and Milwaukee, 50c.; to Superior City, 60c.; to Tawas and Cheboygan, 40c.; to Toledo, 40c.; to Sanduky, 25c.; to Duluth, 60c. on contract; to Green Bay, 60c. Closing with scant supply, and vessels already chartered suffering by delay in procuring their cargoes.

Shipments by lake from September 4th to 10th, both days inclusive, 40,230 tons; namely, 27,440 to Chicago, 4950 to Milwaukee, 1500 to Duluth, 1250 to Green Bay, 1050 to Sandusky, 1500 to Superior City, 600 to Cheboygan, 1940 to Toledo.

The engagements by canal include 2 boat-loads to Syracuse at 75c. a gross ton, and one boat-load to Amsterdam at $1.10 per net ton; captain to pay unloading in all cases.

On Saturday morning, news was received by telegraph from Wilkes-Barre that the Enterprise mine, owned and operated by Mr. Andrew Langdon, of this city, had caved in to the extent of from 4 to 6 feet under 100 acres of ground. Five hundred persons were thrown out of employment by the disaster. The mine was full of gas, and water was pouring in through fissures. And as the cap-sheaf, that the owner had been offered $300,000 last week for his interest, and he had refused it. Later dispatches said, "Danger is past; no evidence of water; the mine is all right." Mr. Langdon is not pleased with the yarn; he said on Monday, "The facts have been grossly exaggerated. The property lies on both sides of the river. That on the west side never has been worked, and of 188 acres on the east side, where the cave-in occurred, but 100 acres have been worked. The latest advices are, that but fifteen or twenty acres have fallen, and so far no water has appeared. The damages will be repaired as soon as possible. Over 400 acres of virgin coal lands remain. Cave-ins are of frequent occurrence and are sometimes brought about purposely where lands have been worked out. In this case, the cave-in is over property worked out and which has no use except as a passage-way to the workings. The report that an offer of $300,000 was refused yesterday is without any foundation in fact. No proposition has been made, and the property is not for sale."

Work at the anthracite coal mines has been resumed. "It remains to be seen whether the jarring elements among the officials of the anthracite companies," says *Bradstreet's*, "can be brought to one mind respecting the stoppage of a second week this month." And further, "A recognized authority has stated that at least another week of idleness in September, one in October, and one in November will be necessary to give the desired stability to prices."

Receipts by Lake Shore & Michigan Southern Railroad for the past week, 864 tons; 660 for Buffalo, and 204 for other points.

Receipts by canal for the past week, 8500 tons; shipments, none.

Receipts by lake, none.

Receipts at Duluth for the past week, none; total thus far this season, 203,497 tons.

Boston. Sept. 11.

[From our Special Correspondent.]

The returns are now in for August business, and they show, as we have all along claimed, that a very large amount of coal has been received in Boston in the last few weeks. In fact, the total receipts of domestic coal at this port for the month of August, 310,832 tons, have never been exceeded during a similar period. In one day, 51,000 tons were received, and 46,000 tons in another. Since January 1st, the receipts have been 1,435,669 tons, against 1,447,153 tons for the corresponding eight months of 1883, showing a falling off of only 11,484 tons. It is not probable, however, that this ratio will be continued to the end of the year. Thousands of tons of bituminous coal have come forward with the low freights, which usually figure in the receipts of a later period.

The anthracite branch of the market is in the same

anomalous condition. There is not enough stove coal at Port Richmond to supply needs, while New York has a great sufficiency. No one has sufficient confidence in the market. While it seems by no means probable that the combination will be wrecked at this late day, yet it continues to nullify the effect of restriction by mining at the rate of forty-four million tons a year when a full-time week is obtained. This is a very poor inducement to timid trade, and it will be necessary for the combination to give a further demonstration of its intention to keep tide-water stocks within bounds before any satisfactory buying can be looked for from this quarter. Stove coal can be had at $4 f. o. b. at New York, of outside companies, and this represents a recent decline of from 10 to 15 cents.

The companies continue to ask $4.25, but sell only an exceptional cargo at those figures. The amount of stove coal which has come to Boston thus far at a greater cost than $4.10 f. o. b. at New York, or its equivalent at Philadelphia, is very small. Dealers selling outside coal find usual competition from those known only as sellers of company coal. The latter are doubtless getting their coal at old figures in some way or other. Except for broken coal, the present company quotations are nominal. Broken size is weak, and all are anxious to sell in order to avoid re-breaking. This is not to be wondered at when it s known that the receipts thus far this year from Baltimore have exceeded those of last year by 155,000 tons. Richmond and all other soft coal ports have sent 54,000 tons less; but this leaves a gain of 100,000 tons bituminous coal, and there can be no doubt that much of this gain is in coal that has eplaced broken for steam purposes.

Our f. o. b. quotations are nominally as follows:

At New York, Stove, $4.25; Broken and Egg, $3.50@$3.65; individual coals, $4@$4.10 for Stove, $3.25@$3.50 for Broken and Egg. At Philadelphia, $3.90@$4.05 for Stove, $3.65 for Chestnut, $3.35@$3.50 for Broken and Egg, $2.35 for Pea. Special coals, $4.85@$5 for Broken, $5.35@$5.50 for Stove.

There is very little bituminous trade, with the situation in buyer's favor. Very low figures rule, quoting $3.50@$3.65, the latter for the best coal in the market. The demand is light. Many mills are shut down, and there has been an abundance of water-power all the year.

Low freights continue, although Baltimore continues a little out of proportion. If any number of vessels "tie up," there may be an advance in rates, but otherwise there is little prospect of one at present. We quote: New York, 85c.@90c.; Philadelphia, $1@$1.10; Baltimore, $1.15@$1.20; Newport News, $1.10@$1.15; Richmond, $1.20@$1.25; Cape Breton, $1.50; Bay of Fundy, $1.30.

Retail demand is small as yet, but an improvement is expected. Prices receive no strengthening aid from the wholesale situation. We quote ton lots, delivered:

White ash, furnace, and egg	$5.50
" " stove and nut	5.75
Red ash, egg	6.00
" " stove	6.25
Lorberry, egg and stove	$6.75@ 7.00
Franklin, egg and stove	7.50
Lehigh, furnace, egg and stove	5.75
" nut	5.75

Wharf quotations: $4.50. Broken; $4.85, Stove.

Provincial receipts show a falling off of 13,040 tons from January 1st to August 1st, having been only 19,552 tons.

Ohio.

Sept. 9.

[From our Traveling Correspondent.]

The situation with reference to both the coal and iron trade of Ohio is best expressed by the word "quiet." No further very violent demonstrations have been made by the striking miners of the Hocking Valley, and the operators continue to increase their output with the non-union men. Indeed, there is no doubt of the determination of the Columbus & Hocking Coal and Iron Company and the Ohio Coal Exchange to have nothing further to do with the Miners' Union. The shutting down indefinitely of the Ohio Central mines has cut off the principal source of support from the striking miners, and many of them will be compelled to take work from their former employers on such terms as the operators are willing to grant. The struggle in the Hocking Valley is watched with great interest by the operators in other districts of Ohio, and with solicitude by some; for if the operators in the Hocking Valley succeed in mining coal at 50 cents a ton, Tuscarawas and similar coals will be shut out of the general market, as it will be impossible to mine 3½ or 4-foot seams of the cheaper qualities of Ohio coals at that rate. The Massillon mines will continue to enjoy the benefit of such prices, on account of the superior grade, that the price of Hocking can not seriously affect them. In fact, notwithstanding the dullness of the year so far, there are Massillon mines that have been running full all the season. This is notably true of Beaver Run mine, the product of which is handled in Cleveland, by J. A. Beidler & Co. The Valley (Cleveland, Akron & Canton) has been carrying an average of 90 cars a day from the mines immediately on its line, and in addition a considerable quantity that has come from the Pittsburg, Cleveland & Toledo, and some from the Wheeling & Lake Erie. The operations in and about Cambridge have been more than usually active, and at least two new mines have been opened in the district, the principal outlet from which seems to be Toledo. Cleveland's retail dealers' association having gone to pieces, prices are somewhat more irregular than in former years.

A visit to the Cincinnati Exhibition revealed the usual display and about the usual attendance. A government exhibit, including many specimens from the Patent-Office and the Museum of Collections and Naval and Post-Office departments, is the most important of the new features. Power Hall, in its general arrangement and display, is decidedly more attractive than ever before. Among the larger displays of machinery I noticed that of J. A. Fay & Co., wood-working machines; G. H. Gray, Jr., & Co., iron planers and lathes; Niles Tool Works, Hamilton, Ohio, machinists' tools; the Long & Allstatter Company, of Hamilton, Ohio, power presses; Bradley & Co., Syracuse, N. Y., cushioned hammers. Post & Co., of Cincinnati, have a fine display of general machinery for which they are the agents. Beutel, Mogedant & Co., of Hamilton County, have a large display of saws and a variety of wood-working machines. The Holt Hoop Machine Company, of Concord, N. H., hoop machinery. The Hoven, Owen & Reutschler Company, of Hamilton, has one of its 140 horse-power "Hamilton Corliss" automatic cut-off engines running. The Lane & Bodley Company, of Cincinnati, makes its usual large display, among which are two "center crank" and one Corliss engine; the latter, a 16 by 42 cylinder, is a new venture by the Lane & Bodley Company. It has erected a separate building to be devoted to the manufacture of Corliss engines exclusively, and will hereafter make this a special feature of its extensive business.

STATISTICS OF COAL PRODUCTION

Comparative statement of the production of anthracite coal for the week ended September 6th, and year from January 1st:

TONS OF 2240 LBS.	1884. Week.	1884. Year.	1883. Week.	1883. Year.
Wyoming Region.				
D. & H. Canal Co.		2,455,427	99,192	2,632,354
D. L. & W. RR. Co.	26,918	3,296,902	110,372	3,309,554
Penna. Coal Co.	1,297	832,676	35,711	953,949
L. V. RR. Co.		908,010	27,269	930,040
P. & N. Y. RR. Co.		146,506	3,949	141,511
C. RR. of N. J.	*	*	*	1,202,078
Penn. Canal Co.	13,656	264,237	19,358	301,445
North & West Br. RR.	17,754	566,404	7,342	301,167
	59,625	8,470,162	303,193	9,772,098
Lehigh Region.				
L. V. RR. Co.		2,924,144	111,567	3,313,430
C. RR. of N. J.	*	*	*	1,126,889
S. H. & W. B. RR.	3,599	131,437		35,076
	3,599	3,055,581	111,567	4,475,395
Schuylkill Region.				
P. & R. RR. Co.	168	7,059,911	290,183	5,860,498
Shamokin & Lykens Val.	*	*	*	950,363
	168	7,059,911	290,183	6,810,861
Sullivan Region.				
St Line & Sul. RR. Co.		43,411	1,555	43,095
Total	63,392	18,629,065	706,498	21,101,449
Increase				
Decrease		2,472,384		

* Included in tonnage of the Philadelphia & Reading Railroad.

Total same time in 1879.....17,523,177 tons.
" " " " 1880.....14,941,806 "
" " " " 1881.....18,629,205 "
" " " " 1882.....18,860,335 "

The above table does not include the amount of coal consumed and sold at the mines, which is about six per cent of the whole production.

Comparative Statement of the Production of Bituminous Coal for the week ended September 6th, and year from January 1st:

Tons of 2000 pounds, unless otherwise designated.

	1884. Week.	1884. Year.	1883. Week.	1883. Year.
Cumberland Region, Md.				
Tons of 2240 lbs.	49,054	1,887,570	63,809	1,676,614
Barclay Region, Pa.				
Barclay RR., tons of 2240 lbs.	4,638	204,619	6,090	215,237
Broad Top Region, Pa.				
Huntington & Broad Top RR., of 2240 lbs	*	125,803	3,049	126,391
East Broad Top			384	27,394
Clearfield Region, Pa.				
Snow Shoe	2,937	122,967	2,701	158,045
Karthaus (Keating)	1,087	29,525		
Tyrone & Clearfield	60,591	2,109,861	54,632	1,907,427
Alleghany Region, Pa				
Gallitzin & Mountain	6,810	254,878	5,025	293,798
Pittsburg Region, Pa.				
West Penn RR.	5,171	190,045	4,213	278,192
SouthwestPenn. RR.	1,528	89,607	2,476	72,918
Pennsylvania RR.	5,708	190,120	14,194	400,056
Westmoreland Region, Pa.				
Pennsylvania RR.	28,918	879,574	37,074	949,831
Monongahela Region, Pa.				
Pennsylvania RR.	3,513	103,472		
Total	169,955	6,188,041	193,647	6,105,903
Increase		82,138		
Decrease				

* Report not received.

Comparative Statement of the Transportation of Coke over the Pennsylvania Railroad for the week ended September 6th, and year from January 1st:

Tons of 2000 pounds.

	1884. Week.	1884. Year.	1883. Week.	1883. Year.
Gallitzin & Mountain (Alleghany Region)	3,272	90,863	1,084	57,214
West Penn. RR.		24,865	1,368	70,785
Southwest Penn. RR.	39,518	1,527,798	38,134	1,431,955
Penn. & Westmoreland Region, Pa. RR.	4,043	131,080	4,798	152,435
Monongahela, Penn. RR.	1,072	52,926		
Pittsburg Region, Pa. RR.		136	455	2,357
Snow Shoe (Clearfield Region)	499	15,951	257	12,932
Total	48,404	1,843,619	46,096	1,727,678
Increase		115,941		

The increase in shipments of Cumberland Coal over th Cumberland Branch and Cumberland & Pennsylvania railroads amounts to 125,329 tons, as compared with the corresponding period in 1883.

RICHARDS & CO.,
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PATENTS THOMAS S. SIMPSON, Patent Lawyer, formerly Examiner in Patent Office, Metallurgic Class. Have prepared or revised more than 16,000 cases. Personally acquainted with all the Examiners. Terms moderate. Write for my Inventors' Guide. Office, No. 12 Federal Building, opposite Patent-Office, Washington, D. C.

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LOST OR STOLEN.—NOTICE IS HEREBY given, that Certificates Nos. 33, 34, 35, and 36, issued to and in the name of W. C. Parsons, on the 18th day of November, A. D. 1882, for 5000 shares each of stock in the *Contention Consolidated Mining Company*, owned by W. C. Parsons, the undersigned, have been lost or mislaid, and the transfer has been stopped at the offices of the Company in New York and San Francisco, and the public are hereby warned against negotiating or purchasing the same. This notice is published in pursuance of an order of the Superior Court of the State of California, in and for the City and County of San Francisco, in a suit pending therein, wherein said Parsons, as plaintiff, seeks a judgment against the Contention Consolidated Mining Company as defendant, requiring it to issue and deliver to said W. C. Parsons a new certificate or certificates of stock for the 20,000 shares represented by said certificates lost or mislaid as aforesaid.—W. C. PARSONS, No. 330 Pine St., San Francisco, Cal.

August 29, 1884.

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